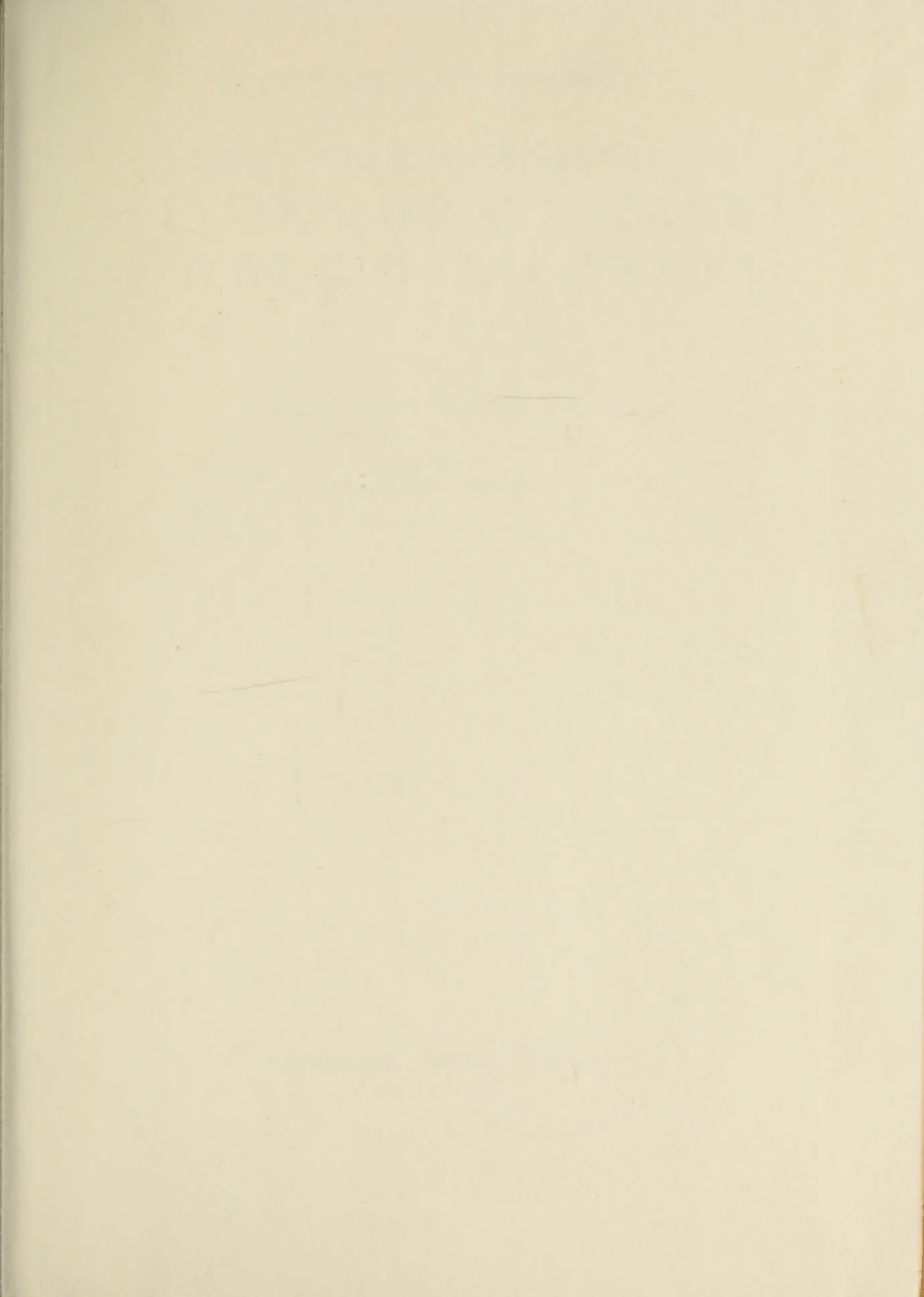
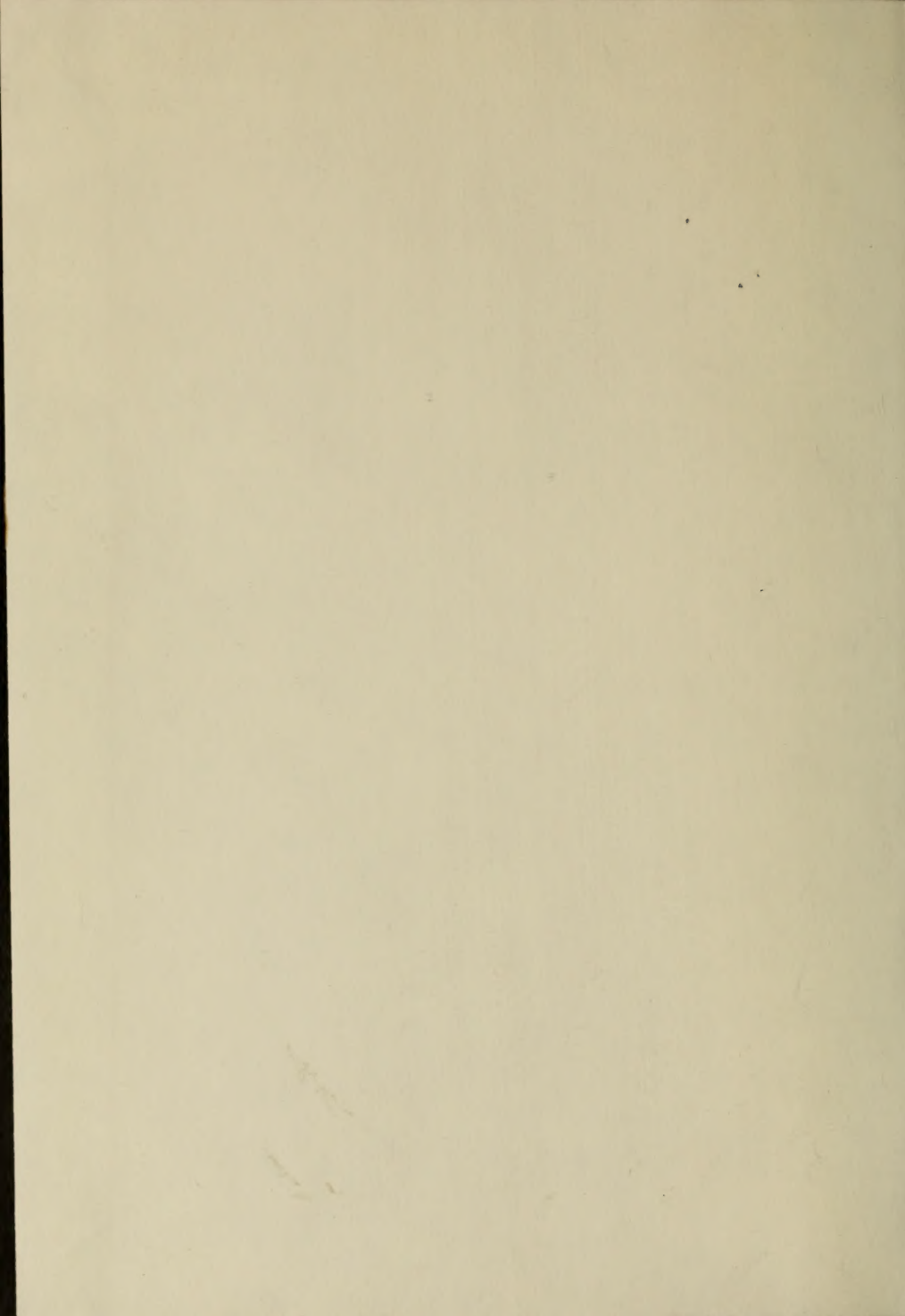


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A FLORA OF WESTERN
MIDDLE CALIFORNIA

BY

WILLIS LINN JEPSON, PH. D.

OF THE

UNIVERSITY OF CALIFORNIA

SECOND EDITION

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PREFACE

The Flora of Western Middle California includes a descriptive account of the native and naturalized plants growing in the region about San Francisco Bay, east to the Sacramento and San Joaquin rivers, north to the south line of the counties of Mendocino, Lake and Colusa, and south to the Pajaro River and Pacheco Pass. While the geographical limits are marked almost throughout by the natural features of rivers, mountain ranges and valleys, the area as a whole is not an especially natural one. Rather, this area (the choice of which was governed both by the needs of its human population and by its accessibility) comprises portions of several distinct areas, namely, the North Coast Ranges, the South Coast Ranges and the Great Valley of California.

The most distinctive and sharply defined feature of the region of this Flora is the Redwood belt. The Redwood (*Sequoia sempervirens*) grows in a narrow strip along the coast, mainly on the western face of the outer (or seaward) Coast Range. Wherever the main range breaks down to low sandy or clay hills, below 500 to 1800 feet in altitude, the Redwood does not grow, and there are in consequence transverse gaps in the continuity of the Redwood belt. Such gaps occur in central and northern Marin county, on the San Francisco peninsula, and in the Pajaro and Salinas valleys between the Santa Cruz and Santa Lucia mountains. Associated with the Redwood are the Tan Oak, Madroña and Douglas Fir, and growing on the forest floor we find such distinctive Redwood plants as *Oxalis oregana*, *Sclipus bigelovii*, *Clintonia andrewsiana*, *Vancouveria parviflora*, *Viola sarmentosa*, *Vaccinium ovatum* and *Gaultheria shallon*.

In climate and in plant population the Redwood belt presents as a whole slight diversity. Its climate is very uniform, showing comparatively slight differences in temperature throughout the year, with a rainy season succeeded by a season of fogs. Outside the Redwood belt is a beach strip characterized by such shore species as *Abronia latifolia* and *umbellata*, *Lathyrus littoralis*, *Lupinus littoralis*, *Atriplex californica*, *Mesembryanthemum aequilaterale*, *Artemisia pycnocephala*, *Franseria bipinnatifida* and *chamissonis*.

The climate of the Coast Ranges inside the Redwood belt and of the Great Valley is markedly different from that of the immediate coast or Redwood region. These areas have also but two seasons, a rainy season lasting from November to April and a dry season from May to October, when rain is normally absent. March and April may, however, be spoken of as spring months since the annual vegetation is then at its height, and September and October as fall months since then is the period of greatest development of the fall flora.

The Coast Ranges of our region are characterized by barren slopes or hills, by slopes openly wooded with oaks, or by chaparral, the latter being the most marked feature. The term chaparral refers to the extensive and dense colonies of shrubs which clothe mountain slopes and ridges and includes such typical

species as *Ceanothus cuneatus*, *Arctostaphylos manzanita* and *tomentosa*, *Pickeringia montana*, and *Quercus dumosa* and *wislizenii* var. *frutescens*. By reason of the uniformity of the conditions governing growth in the chaparral, the very low water content of the rocky or gravelly slopes, the high summer temperature and high insolation, these shrubs present a similar aspect by virtue of their uniform height, reduced leaf surface, frequently thorny or thorn-like branchlets and rigid branches. The open slopes of this region, the slopes and low hills destitute of woody growth, are extensive and covered in the vegetative season with a growth of grasses and perianth-bearing endogens and exogens developed in considerable richness. Some of the species most abundant in individuals and consequently in wide areas the dominating species of the vernal flora are as follows: *Avena fatua*, *Danthonia californica*, *Festuca myuros*, *Lolium temulentum*, *Hordeum nodosum* and *murinum*, *Brodiaea capitata*, *Ranunculus californicus*, *Linanthus parviflorus*, *Phacelia distans*, *Plagiobothrys canescens*, *Orthocarpus erianthus*, varieties of *Mimulus langsdorffii*, *Castilleja foliolosa* and *Baeria chrysostoma*. These species, not to include very many others, are widely distributed in both the North Coast Ranges and the South Coast Ranges, ranges lying respectively north and south of the Bay of San Francisco and its connecting arms. The Golden Gate and San Francisco Bay represent, however, a not unimportant natural barrier, since many species of the Oregon and Washington flora range southward in the North Coast Ranges as far as San Francisco Bay, and similarly many species of Southern California range northward as far as the Santa Cruz Mountains or Mt. Diablo. In the view of the author this barrier is a barrier mainly or perhaps wholly in the sense that, in connection with topography, it indicates certain climatic limits which the species in question do not transgress.

In relation to local species the region immediately north and south of the Bay has some interest in plant geography. *Campanula erigua* is found only on the summits of Mt. Diablo, Mt. Tamalpais and Mt. Hamilton. *Calochortus pulchellus* is local about Mt. Diablo and *Streptanthus hispidus* in the inner South Coast Range. Other local species are *Chorizanthe valida*, *Arabis breweri* and *blepharophylla*, *Trifolium dichotomum* and *californicum*, *Psoralea strobilina* and *douglasii*, *Astragalus tener* and *Arctostaphylos nummularia* and *andersonii*. In this connection may be mentioned the genus *Ceanothus* represented by fourteen species in the Bay region, of which eight are nearly or quite restricted to the central Coast Ranges.

The extensive plains of the Great Valley (the Sacramento and San Joaquin) are level and treeless, save for oak groves on restricted areas, mainly along streams, or for a fringe of trees bordering the rivers. The climate is very uniform throughout the Great Valley, but the soil areas and water content change greatly and repeatedly, often within short distance. There are, moreover, two distinct seasonal floras, the vernal and the fall, with an intervening dry period when the vernal vegetation is killed or dried up, and the seedlings or perennial herbs which are to flower in the fall are growing slowly.

The vernal flora of the fertile alluvial plains is rich and varied, a statement which refers to areas undisturbed by civilization. The composition of this flora is marked by a large number of species of Leguminosae, Polemonia-

ceae, Boraginaceae, Scrophulariaceae and Compositae. Some of the most dominant plants are *Eschscholtzia californica*, *Trifolium tridentatum*, *microdon* and *columbinum*, *Lupinus affinis*, *nanus*, *micranthus* and *microcarpus*, *Gilia achillaeifolia* and *bicolor*, *Nemophila menziesii*, *Phacelia tanacetifolia*, *Allo-carya stipitata* and *californica*, *Amsinckia intermedia*, *Orthocarpus purpur-ascens*, *erianthus* and *lithospermoides*, *Microseris douglasii* and *elegans*, *Baeria fremontii* and *Achyrrachaena mollis*.

Alkaline areas of the plains, whether very limited spots or extensive plains, have their own peculiar species. The most abundant and widely distributed in our region are *Distichlis spicata*, *Nitrophila occidentalis*, *Atriplex bracteosa*, *Astragalus tener*, *Sida hederacea*, *Peucedanum caruifolium*, *Cressa cretica* and *Baeria platycarpa*.

Scattered over the plain of the valley floor the traveler finds small depressions a few yards square and a few inches deep which fill with water in the rainy season. When such pools are a little deeper, well-defined and numerous, they take the name of "hog wallows." The beds of these pools in late spring or early summer give rise to a distinctive flora composed of such species as *Lilaea subulata*, *Downingia elegans* and *pulchella*, *Mimulus bicolor*, *Boisduvalia cleistogama* and *glabella* var. *campestris*, *Lepidium latipes*, *Gilia leucocephala* and *Psilocarphus brevissimus*. They are diminutive or dwarfish plants with small or narrow leaves.

The fall flora of the valley plains is represented by great colonies of a comparatively few species. The most important species are *Eremocarpus setigerus*, *Grindelia camporum* and more especially the various tarweeds such as *Hemizonia luzulaefolia*, *virgata* and *kelloggii*, and *Centromadia pungens* and *fitchii*.

The last important feature of our flora needing mention are the salt marshes about San Francisco, San Pablo and Suisun bays, which support a formation of rushes, sedges and allied plants, rather varied in species and usually very strong in individuals.

The flora of western middle California, thus so briefly sketched, has been and is still being rapidly modified by the occupations of man. Many species which were once common are now less common or rare. Changes induced in the native plant population by civilization are not, however, always adverse to a species. Some species find improved conditions of existence under civilization. *Phacelia tanacetifolia* and *Tropidocarpum gracile* flourish in grain fields, and *Montia gypsophiloides* and *Calandrinia caulescens* var. *menziesii* (if this latter be a native plant) thrive and perfect their seeds in orchards and vineyards in the rainy period that just precedes the spring cultivation. In valley lands *Calochortus uniflorus* is materially assisted in its habits of vegetative propagation by the disturbance of the soil in plowing and the consequent separation and scattering of its bulblets.

On the other hand aliens, especially from the Mediterranean region, are successfully and surely invading extensive tracts and dispossessing the natives. Species of this type, introduced in later days, are *Picris echinoides* and *Centaurea calcitrapa* and *solstitialis*. The progress of these and other plants are deserving of the attention of all local botanists interested in the native flora,

since here are important phenomena of considerable migrations being enacted before our eyes.

The issue of the present edition has been considerably hastened by reason of the destruction of the supply of the first edition in the San Francisco disaster of 1906. The student will find that the number of species has been little increased over the first edition. It will also be noted that many propositions of new species, especially of more recent years, do not here receive mention, but it is by no means implied that these are not of interest or of value. It is only meant that the natural limits of time, endeavor and opportunity make it necessary and proper that results organized and available should not be handicapped or unduly delayed by propositions which are the work of many different hands and indicate many different points of view. Such varied propositions should have that consideration which only a more prolonged period affords.

In the preparation of this edition the author is under obligation to not a few botanists for suggestions, notes and specimens. Dr. H. M. Hall, Assistant Professor of Botany in the University of California, has been helpful in many ways and to him the author desires to express his obligations for many courtesies. Many valuable notes, especially on the Liliaceae, have been received from Mr. Carl Purdy of Ukiah. Mr. S. B. Parish has continued his kindly and helpful aid. Dr. R. J. Smith has sent useful material from the Mt. Hamilton Range. Revisions of the genera *Trifolium* and *Nemophila*, respectively, have been generously provided by my former students, Miss Laura F. McDermott and Mr. Harley P. Chandler. The account of the grasses by Mr. J. B. Davy, now Botanist to the Transvaal Government, has been reprinted substantially without change. Miss Leila D. Hibbard, one of my students, contributed welcome aid in the arrangement of the manuscript for the printer. Many others who have furnished notes or specimens find mention at proper places in the text. Finally acknowledgment is due to Mr. Joseph W. Flinn, University Printer, for his expert advice in regard to matters connected with the printers' art.

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February 2, 1910.

KEY TO THE FAMILIES OF SEED PLANTS OF WESTERN MIDDLE CALIFORNIA

GYMNOSPERMS.

Ovules and seeds borne naked on the surface of a scale; stamen and ovules in catkin-like clusters; cotyledons 2 to 17; cone-bearing trees or shrubs, all of ours evergreen; leaves needle-like, narrowly linear, awl-like or scale-like.

Fruit a woody cone, containing several to many seeds.

Cone-scales imbricated, with a conspicuous or minute bract at base on lower side; leaves needle-like or narrowly linear; seeds 2 to each scale, bearing a thin wing.....PINACEAE, p. 17.

Cone-scales without bracts.

Leaves narrowly linear and 2-ranked in flat sprays, or lanceolate or awl-like and disposed all around the branchlet; cone-scales not imbricated, ending in broad flattish summits; seeds 2 to 9 to each scale, not wingedTAXODIACEAE, p. 22.

Leaves minute and scale-like, thickly clothing the ultimate branchlets; cone-scales imbricated, or with broad flattish summits and not imbricated; seeds 1 to several to each scale, winged or wingless.....

CUPRESSACEAE, p. 23.

Fruit berry-like or drupe-like, one-seeded; leaves narrowly linear, in flat sprays.

TAXACEAE, p. 25.

ANGIOSPERMS.

Ovules borne in a closed sac or ovary, which becomes the fruit and encloses the seed; cotyledons 1 or 2; plants with true flowers, typically with an abbreviated stem (receptacle) bearing regular whorls of floral envelopes, stamens and pistils.

CLASS 1.—MONOCOTS.

Leaves with parallel veins (except Trillium); parts of the flowers usually in 3s, never in 4s or 5s; vascular bundles scattered irregularly through the pithy tissue, not in rings or annual layers; embryo with 1 cotyledon; all ours herbs, when perennial commonly with rootstocks or bulbs.

A. Perianth none or calyx-like with scale-like divisions; parts of the flower mostly unequal in number; carpels 1 or more, distinct (in Triglochin united but separating at maturity).

1. FLOWERS NOT IN THE AXILS OF DRY CHAFFY BRACTS.

Leafless minute aquatics, the stems represented by leaf-like floating fronds....

LEMNACEAE, p. 87.

Leafy plants.

Immersed aquatics; leaves filiform or linear, or some floating ones with broad blades; flowers naked or with a very small calyx; stamens 1 to 4.

NAIADACEAE, p. 27.

Plants of marshes or rising out of water.

Flowers monoecious; reed-like plants.

Inflorescence a dense cylindrical spike.....TYPHACEAE, p. 26.

Inflorescence a dense globose head.....SPARGANIACEAE, p. 27.

Flowers perfect, rarely polygamous, in racemes or spikes.

Inflorescence with a spathe; calyx 4-lobed; stamens 4.ARACEAE, p. 87.

Inflorescence naked; calyx of 6 distinct sepals, or none; stamens 6 or 1.
JUNCAGINACEAE, p. 31.

2. FLOWERS IN THE AXILS OF DRY CHAFFY BRACTS, ARRANGED IN SPIKES OR SPIKELETS.

Stems mostly terete and hollow; leaves in 2 rows; sheaths mostly split open opposite the blade; bractlets 2 to each flower; fruit a grain (seed adnate to the pericarp)GRAMINEAE, p. 34.

Stems mostly triangular, solid; leaves in 3 rows; sheaths entire; ligule obsolete or minute; bractlet 1 to each flower; fruit an achene (seed free from the pericarp)CYPERACEAE, p. 80.

B. Perianth always present, its segments in 2 series, often corolla-like; parts of the flower usually equal in number; carpels united into one compound ovary.

Ovaries several, distinct, becoming achenes; perianth of 3 sepals and 3 petals.
ALISMACEAE, p. 32.

Ovary 1 and

Superior; perianth regular; stamens 6, sometimes 3 or 4.

Perianth-segments distinct, green or brown, not petal-like; rush-like plants.
JUNCACEAE, p. 89.

Perianth-segments distinct or partly united, at least the inner petal-like; plants not rush-likeLILIACEAE, p. 92.

Inferior.

Perianth regular; stamens 3IRIDACEAE, p. 110.

Perianth irregular; stamens 1, rarely 2ORCHIDACEAE, p. 112.

CLASS 2.—DICOTS.

Leaves netted-veined; parts of the flower mostly in 4s or 5s; vascular bundles in a ring around a central pith, the stem when perennial increasing in girth by annual layers; embryo with 2 cotyledons.

I. APETALOUS DIVISION. Corolla none; calyx present, herbaceous or sometimes petal-like, sometimes none.

A. Flowers monoecious or dioecious, one or both kinds in catkins; trees or shrubs.

1. LEAVES PINNATELY COMPOUND.

Leaves alternate; only the staminate flowers in catkins; fruit a nut with a fibrous coatJUGLANDACEAE, p. 120.

2. LEAVES SIMPLE.

Leaves opposite; flower dioecious, 1 to 3 in each axil of the connate bracts.
GARRYACEAE, p. 304.

Leaves alternate.

Both kinds of flowers in catkins.

Flowers 1 to each scale or bract; perianth none.

Fruit a 1-celled many-seeded capsule; seeds with a coma; flowers dioecious; foliage deciduousSALICACEAE, p. 117.

Fruit a waxy-coated berry; flowers monoecious or dioecious; foliage evergreenMYRICACEAE, p. 120.

- Flowers 2 or 3 to each scale or bract; staminate catkin long, pendulous, the pistillate small, spike-like, maturing into a woody cone containing margined achenes.....ALNUS, p. 121.
 Only the staminate (rarely the pistillate) flowers in catkins.
 Fruit a nut enclosed in a leafy tubular involucre.....CORYLUS, p. 121.
 Fruit a nut set in a scaly cup or bur (acorn or chestnut). FAGACEAE, p. 121.

B. Flowers not in catkins.

1. TREES, SHRUBS, OR WOODY CLIMBERS.

a. *Leaves opposite; flowers dioecious or polygamo-dioecious.*

- Ovary inferior; fruit a berry; leaves simple, foliaceous or scale-like; parasitic on trees.....LORANTHACEAE, p. 307.
 Ovary superior; leaves pinnate; trees or climbers.
 Stamens 4 or 5; fruit a double samara.....ACER, p. 250.
 Stamens commonly 2; fruit a simple samara.....FRAXINUS, p. 319.
 Stamens numerous; sepals 4, petal-like; fruit a tailed achene; climbing plants.....CLEMATIS, p. 168.

b. *Leaves alternate and simple.*

- Flowers monoecious, in head-like clusters scattered on a slender axis; calyx none.....PLATANACEAE, p. 126.
 Flowers perfect or unisexual; sepals and stamens 4 or 5; fruit berry-like.... RHAMNUS, p. 251.
 Flowers perfect.
 Stamens 6 to numerous.
 Erect trees or shrubs.
 Calyx of 6 petal-like sepals; stamens 9, the anthers opening by valves; fruit a drupe; evergreen.....LAURACEAE, p. 174.
 Calyx 5-lobed; stamens numerous, 25 to 60, inserted on the calyx; fruit a tailed achene.....CERCOCARPUS, p. 205.
 Calyx 4-cleft, corolla-like; low shrub with tough leathery stems..... THYMELEACEAE, p. 256.
 Climbing plant; calyx tubular; stamens 6, anthers sessile; capsule 6-celled.....ARISTOLOCHIA, p. 307.
 Stamens 5, monadelphous; calyx 5-cleft; showy; capsule 4 or 5-celled..... FREMONTIA, p. 262.
 Stamens 1 or 2; calyx of 4 or 5 sepals; leaves scale-like; fruit a utricle... SPIROSTACHYS, p. 145.

2. HERBS.

a. *Ovary superior, i. e., free from the calyx.*

† Calyx present; corolla none.

- Pistil 1, 1-celled; stigmas or styles often more than one.

Stipules present.

Leaves alternate; fruit an achene.

- Stipules sheathing, scarious; calyx 5 to 6-cleft or -parted, or of distinct sepals, often petal-like; stamens 4 to 9; fruit a 3-sided or lenticular achene.....POLYGONACEAE, p. 128.

Stipules not sheathing; calyx greenish; stamens 1 to 4.

- Flowers monoecious, very small, in catkin-like inflorescences; plants with stinging herbage.....URTICACEAE, p. 126.
 Flowers perfect, fascicled; diminutive annual. ALCHEMILLA, p. 210.

Leaves opposite, small or prostrate herbs.

Calyx of 5 distinct sepals; stamens 3 to 5.

Fruit an achene or utricle; stipules scarious. *CARYOPHYLLACEAE*, p. 150.

Fruit a 3-valved capsule; stipules setaceous. *LOEFLINGIA*, p. 157.

Calyx 5-cleft; capsule circumscissile; stipules laciniate; stamens 1 to 3.

CYPSELEA, p. 149.

Stipules none.

Fruit an achene or utricle.

Leaves opposite or whorled.

Calyx tubular, corolla-like, the base of the tube hardening and enclosing the achene; prostrate maritime herbs. . . *NYCTAGINACEAE*, p. 147.

Calyx of 6 (rarely 5) distinct often petal-like sepals; fruit a 3-sided or lenticular achene; leaves opposite or whorled.

POLYGONACEAE, p. 128.

Leaves alternate or opposite.

Calyx of 5 or fewer sepals.

Sepals herbaceous or, in unisexual flowers, the pistillate without calyx and enclosed by two bracts; bractlets none; mostly scurfy plants of alkaline or maritime habitat. *CHENOPODIACEAE*, p. 139.

Sepals membranous or scarious; flowers with bractlets.

AMARANTACEAE, p. 147.

Calyx 6-parted; flowers borne in an involucre. . . . *ERIOGONUM*, p. 131.

Fruit a capsule; leaves opposite or whorled.

Calyx 5-merous.

Ovary 3 to 5-celled. *AIZOACEAE*, p. 148.

Ovary 1-celled. *GLAUX*, p. 316.

Calyx 4-merous; diminutive annual. *SAGINA APETALA*, p. 155.

Pistils more than 1 and distinct, becoming achenes.

Sepals unarmcd, commonly 5, distinct, often petal-like; stamens many; achenes several. *RANUNCULACEAE*, p. 164.

Calyx-tube armed with barbed prickles, its limb 3 to 7-parted; leaflets pinatifid; achenes 1 or 2. *ACAENA*, p. 210.

† † Calyx and corolla both wanting; pistil 1.

Flowers perfect, borne in a spike, subtended by a conspicuous colored involucre; herb of saline habitat. *ANEMOPSIS*, p. 116.

Flowers monoecious.

Terrestrial plants; flower-clusters often surrounded by a petal-like involucre resembling a perianth; stamens 1 to many; capsule 3 (or 1) -celled;

juice often milky. *EUPHORBIACEAE*, p. 244.

Aquatic plants; leaves opposite; stamen 1.

Leaves dissected; ovary 1-celled, in fruit a spinose or tuberculate achene. .

CERATOPHYLLACEAE, p. 162.

Leaves entire; ovary 4-celled, splitting when ripe into 4 parts.

CALLITRICHACEAE, p. 247.

b. *Ovary inferior, i. e., more or less adherent to the calyx.*

Flowers dioecious or the pistillate with stamens; stamens 8 to 12; capsule 1-celled; leaves alternate, divided. *DATISCAEAE*, p. 269.

Flowers perfect.

Leaves reniform or cordate; calyx-lobes 3, caudate; capsule 6-celled; nearly acaulescent. *ASARUM*, p. 306.

Leaves not reniform or cordate.

Calyx-lobes 4.

Leaves alternate; fruit a 3 to 9-celled bony nut with herbaceous covering; succulent herb.....TETRAGONIA, p. 150.

Leaves opposite; fruit a 4-celled capsule; stems creeping in mud or floating in water.....LUDWIGIA, p. 273.

Calyx entire; stamens 1; fruit nut-like, 1-celled, 1-seeded; aquatics with simple entire leaves in whorls.....HIPURIS, p. 284.

II. CHORIPETALOUS DIVISION. Calyx and corolla present; petals distinct or nearly so.

A. Ovary superior, i. e., free from the calyx.

1. FLOWERS WITH THE STAMENS MONADELPHOUS OR DIADELPHOUS.

Flowers papilionaceous (1 petal in *Amorpha*); ovary 1-celled; stamens 10, united in 1 or 2 sets (distinct in *Pickeringia*); leaves compound (simple in *Cercis*).....LEGUMINOSAE, p. 214.

Flowers not papilionaceous.

Corolla irregular, the petals 4, in 2 dissimilar pairs; sepals 2; stamens 6, slightly united in 2 sets; leaves compound.....DICENTRA, p. 178.

Corolla regular; petals 5; sepals 5.

Stamens 10, more or less united at base; leaves 3-foliate.....
OXALIDACEAE, p. 241.

Stamens numerous, united in a tube around the pistil; leaves simple.....
MALVACEAE, p. 257.

2. FLOWERS WITH THE STAMENS DISTINCT.

a. *Stamens hypogynous, more than 10.*

Pistils several to many, simple and distinct.

Leaves not peltate.

Pistils becoming achenes or folicles.....RANUNCULACEAE, p. 164.

Pistils at first united, later distinct as torulose pods.....
PLATYSTEMON, p. 175.

Leaves peltate; aquatic plant.....BRASENIA, p. 164.

Pistil 1.

Ovary 1-celled, the styles or stigmas often more than one.

Sepals caducous; petals 4 or 6, twice as many as the sepals.....
PAPAVERACEAE, p. 174.

Sepals persistent or at least not caducous.

Acaulescent plants; petals 8 to 16; sepals 4 to 8....LEWISIA, p. 159.

Cauliscent plants.

Petals 5; fruit a capsule; leaves simple, entire.

Sepals 2; styles 3.....CALANDRINIA, p. 159.

Sepals 5, the 2 outer smaller and bract-like; style 1.....
CISTACEAE, p. 265.

Petals 1 or 2; sepals about 4; fruit a berry; leaves compound.....
ACTAEA, p. 167.

Ovary more than 1-celled.

Petals 5; sepals 5; stamens disposed in 3 to 5 indistinct bunches; leaves opposite.....HYPERICACEAE, p. 262.

Petals 10 to 20; sepals 5 to 12; aquatic herbs.....NYMPHAEA, p. 163.

b. *Stamens hypogynous, 10 or fewer.*

Pistils more than 1, distinct, and

Exceeding in number the sepals or petals.....RANUNCULACEAE, p. 164.

- Of the same number as the sepals or petals.....CRASSULACEAE, p. 194.
- Pistils more or less united around a central axis, separating when ripe as 1-seeded carpels; petals 5.
- Stipules scarious; at least the lower leaves opposite; carpels separating elastically from an elongated beak or axis and tailed by the persistent coiled or twisted styles.....GERANIACEAE, p. 241.
- Stipules none; carpels subglobose, rugose, separating from a very short axis, not tailed; leaves alternate.....LIMNANTHACEAE, p. 243.
- Pistil 1, the styles or stigmas sometimes more than one.
- Flower cruciferous, i. e., with 4 sepals, 4 petals, 6 stamens (4 long and 2 short, rarely 4 or 2); ovary 2-celled, becoming in fruit a silique or silicle.....CRUCIFERAE, p. 179.
- Flowers not cruciferous.
- Corolla irregular; petals 5, one with a spur; sepals 5, auricled; stamens 5; fruit a 1-celled capsule.....VIOLACEAE, p. 265.
- Corolla regular.
- Ovary 1-celled.*
- Anthers opening by uplifted valves; petals 6, in whorls of 3; stamens 6; fruit a berry or capsule.....BERBERIDACEAE, p. 172.
- Anthers opening by longitudinal slits; herbs.
- Fruit a capsule opening from the apex by valves or teeth; petals 5 or 4.
- Calyx tubular or of 5 (or 4) distinct sepals; stamens 3 to 10, commonly 5 or 10; capsule 3 to 10-valved or -toothed; placentae central; styles 2 to 5.....CARYOPHYLLACEAE, p. 150.
- Calyx of 2 distinct sepals; stamens 5 (or 3 to many); capsule 3-valved; placentae central or basal; styles 2 to 8.....PORTULACACEAE, p. 158.
- Calyx tubular; stamens 4 to 7; capsule 2 to 4-valved; placentae parietal; style 3-lobed.....FRANKENIACEAE, p. 264.
- Fruit indehiscent; styles, sepals, petals and stamens 5.....PLUMBAGINACEAE, p. 318.
- Ovary more than 1-celled.*
- Anthers opening by pores at the summit; sepals and petals 5 or 4, the stamens as many or twice as many; capsule 5-celled.....ERICACEAE, p. 308.
- Anthers opening by longitudinal slits.
- Saprophyte, in forests.....PLEURICOSPORA, p. 310.
- Herbs, not saprophytic.
- Leaves alternate or basal.
- Sepals 4; petals 4; stamens 6; ovary raised on a stipe; leaves 3-foliate.....CAPPARIDACEAE, p. 194.
- Sepals 5; petals 5; stamens 5; ovary sessile; leaves simple.....LINACEAE, p. 239.
- Leaves opposite; annuals.
- Calyx of 2 distinct sepals; flowers 2 to 5-merous; fruit a 2 to 5-celled capsule.....ELATINACEAE, p. 263.
- Calyx tubular; stamens 10 and petals 5, the latter clawed; fruit an imperfectly 3-celled capsule.....SILENE GALICA, p. 152.
- Shrub; fruit a simple samara; stamens 2; petals 2; leaves opposite, pinnate.....FRAXINUS, p. 319.

c. Stamens perigynous, i. e., on the calyx or on a more or less evident disk.

Stamens on a hypogynous disk or on a disk lining the base of the calyx; trees or shrubs.

Leaves simple; corolla regular; petals usually 5 (4 to 6).

Stamens 5 (or 4), as many as the petals and opposite them.

Shrubs; petals hooded; fruit 3 (or 2) -celled, dry and splitting into 3 (or 2) one-seeded parts.....RHAMNACEAE, p. 251.

Woody vine climbing by tendrils; petals not hooded, caducous; fruit a berry.....VITACEAE, p. 256.

Stamens 5 (4 to 6), as many as the petals and alternate with them; fruit a 3 to 5-celled capsule; seeds with an aril...CELASTRACEAE, p. 249.

Stamens 3 to 10; fruit a double samara.....ACER, p. 250.

Leaves compound; petals 5 or 4.

Stamens 5 to 8; petals clawed, slightly irregular; fruit a 1-seeded capsule; leaves opposite, palmate.....SAPINDACEAE, p. 251.

Stamens (in ours) as many as the petals; corolla regular; leaves alternate, trifoliate.

Styles or stigmas 3; fruit drupe-like.....ANACARDIACEAE, p. 248.

Style 1; fruit a 2-celled, 2-seeded samara.....RUTACEAE, p. 248.

Stamens on the calyx; corolla regular.

Stipules present; pistils one to several, sometimes partly united to the disk; petals 5; stamens 10 to numerous; leaves alternate, often compound...
ROSACEAE, p. 203.

Stipules none; leaves simple.

Pistils many, concealed in a hollow receptacle; stamens numerous; leaves opposite.....CALYCANTHACEAE, p. 172.

Pistil 1; stamens 4 to 10.

Styles or stigmas more than 1; capsule not enclosed by the calyx.....
SAXIFRAGACEAE, p. 197.

Style and stigma 1; capsule enclosed by but free from the calyx.....
LYTHRACEAE, p. 271.

B. Ovary inferior, i. e., more or less adherent to the calyx.

1. TREES AND SHRUBS.

Stamens more numerous than the petals; petals 5.

Leaves alternate; fruit a pome.....ROSACEAE, p. 203.

Leaves opposite; fruit a capsule; trailing undershrub.....WHIPPLEA, p. 201.

Stamens as many as the petals and opposite them; petals 5, hooded; capsule 3-celled, 1 seed in each cell.....CEANOTHUS, p. 252.

Stamens as many as the petals and alternate with them.

Petals 4; style 1; flowers small, in cymes, or if in a head, surrounded by a conspicuous corolla-like involucre; fruit drupe-like; leaves opposite....
CORNACEAE, p. 304.

Petals (in ours) 5; styles 2, more or less distinct; flowers in racemes or solitary; fruit a smooth or prickly berry; leaves alternate, with stipules...
RIBES, p. 201.

2. HERBS.

Petals and stamens numerous; fruit 10 to 12-celled, dehiscing at summit; succulent maritime herb.....MESEMBRYANTHEMUM, p. 150.

Petals 5 or fewer.

Flowers in umbels.

Umbels compound, often simple, sometimes capitate; styles 2; fruit splitting into 2 one-seeded carpels.....UMBELLIFERAE, p. 285.

Umbels simple, panicled; styles 4 or 5; fruit berry-like.....
ARALIACEAE, p. 285.

Flowers not in umbels.

Styles or stigmas 2 to 5; calyx 5-lobed; petals 5; stamens 5 or 10; fruit
a 1 to 3-celled capsule.....SAXIFRAGACEAE, p. 197.

Style 1.

Sepals and petals 4 (rarely 5 or 2), the stamens commonly twice as
many; fruit commonly a 4-celled capsule.....ONAGRACEAE, p. 272.

Sepals and petals 5; stamens numerous; fruit a 1-celled capsule opening
at the top; rough-hairy herbs.....LOASACEAE, p. 267.

Sepals 2; petals 4; stamens 7 to 20; style mostly 3 to 8-parted; fleshy
herb.....PORTULACA, p. 159.

Style none; stigmas 4; leaves in whorls; aquatic plants.....
HALORAGACEAE, p. 284.

III. SYMPETALOUS DIVISION. Calyx and corolla both present, the latter with the petals united, at least at base.

A. Stamens free from the corolla; anthers opening by a pore at the top.

Petals 5; stamens 8 or 10; ovary superior or inferior; leaves simple; trees,
shrubs or herbs.....ERICACEAE, p. 308.

B. Stamens inserted on the corolla; anthers opening by longitudinal slits.

1. STAMENS MORE THAN 5; OVARY SUPERIOR.

Petals 5.

Pistils 4 or 5, distinct; stamens 10.....CRASSULACEAE, p. 194.

Pistil 1.

Stamens 10, di- or mon-adelphous, rarely distinct.

Flowers papilionaceous; ovary 1-celled; style 1, entire; leaves com-
pound (except *Cercis*).....LEGUMINOSAE, p. 214.

Flowers regular; ovary 5-celled; style 5-lobed; leaves 3-foliate....
OXALIDACEAE, p. 241.

Stamens indefinite, monadelphous; ovary 5 to many-celled, either splitting
into as many carpels when ripe or capsular.....MALVACEAE, p. 257.

Petals less than 5.

Leaves entire; petals 3; sepals 5, 2 petal-like; stamens 6 to 8; ovary 2-
celled; flower imitating the papilionaceous.....POLYGALACEAE, p. 244.

Leaves divided; petals 4 in two dissimilar pairs; sepals 2; stamens 6.....
DICENTRA, p. 178.

2. STAMENS 5 OR LESS.

a. *Ovary superior, i. e., free from the calyx.*

† Corolla regular.

Pistil 1.

Stamens as many as the lobes of the corolla and opposite them.

Style 1; fruit a capsule.....PRIMULACEAE, p. 315.

Styles 5; fruit a utricle or achene.....PLUMBAGINACEAE, p. 318.

Stamens as many as or fewer than the lobes of the corolla and alternate with
its lobes; fruit a capsule (or in *Solanum* a berry).

Ovary 1 or 2-celled.

Corolla-tube commonly with internal scales or appendages; flowers
5-merous, in coiled racemes or spikes, or in heads or often solitary;
ovary 1-celled, or 2-celled by the intrusion or union of the placentae
in the axis; style 2-cleft, sometimes entire, or styles 2 and distinct.

HYDROPHYLLACEAE, p. 336.

Corolla-tube without internal scales or appendages; style 1 or none; stigmas 1 or 2.

Ovary and capsule 1-celled; flowers 4 or 5-merous; leaves simple and opposite, or 3-foliate and alternate...GENTIANACEAE, p. 319.

Ovary 2-celled; fruit commonly 2-celled; stamens 5; leaves alternate. Leafless parasitic twining plants.....CUSCUTA, p. 327.

Leafy plants.

Corolla with 5 lengthwise folds and twisted in the bud; calyx of 5 distinct sepals; capsule 1 to 4-seeded.....

CONVOLVULACEAE, p. 324.

Corolla imbricate or valvate in bud and mostly plicate; calyx 5-cleft or -toothed; capsule many seeded..SOLANACEAE, p. 365.

Ovary 2 or 4-celled; capsule circumscissile; corolla scarious; stamens 2 or 4; style 1; acaulescent herbs.....PLANTAGINACEAE, p. 390.

Ovary 3-celled, the flower otherwise 5-merous; style 3-cleft or 3-lobed; capsule 3-valved.....POLEMONIACEAE, p. 328.

Ovary 4-celled and commonly 4-lobed, splitting at maturity into as many nutlets; stamens 5; style 1, entire; leaves alternate (at least the upper); flowers in coiled racemes or spikes...BORAGINACEAE, p. 344.

Pistils 2 (the ovaries distinct but the styles or stigmas united), becoming follicles; leaves opposite or whorled; plants with milky juice.

Stamens and stigmas united, the column bearing hood-like appendages....

ASCLEPIADACEAE, p. 322.

Stamens and stigmas not united; no hoods.....APOCYNACEAE, p. 321.

† † Corolla from strongly bilabiate to slightly irregular.

Stamens 4 or 2.

Fruit a 1-celled capsule.

Stamens 2; corolla spurred; aquatic plants with finely divided leaves, some bearing bladders.....UTRICULARIACEAE, p. 388.

Stamens 4; root-parasites without green foliage..OROBANCHACEAE, p. 388.

Fruit a 2-celled capsule; leaves alternate or opposite; a sterile filament or scale rarely present as a fifth stamen.....SCROPHULARIACEAE, p. 368.

Fruit of 2 to 4 nutlets; leaves opposite.

Ovary not lobed, 2 to 4-celled, splitting into as many nutlets; stamens 4; style 1, entire.....VERBENACEAE, p. 351.

Ovary 4-lobed, splitting into as many nutlets; stamens 4 or 2; style 1, cleft; stems square; herbage with the odor of mint..LABIATAE, p. 352.

Stamens 5, some or all woolly.....VERBASCUM, p. 370.

b. *Ovary inferior, i. e., adherent to the calyx-tube.*

Stamens distinct.

Leaves alternate; flowers regular; stamens 5; ovary and capsule 2 to 5-celled; herbs.....CAMPANULACEAE, p. 399.

Leaves opposite or whorled.

Stamens 1 to 3; flowers irregular; fruit 1-celled, 1-seeded; herbs.....

VALERIANACEAE, p. 397.

Stamens 4 or 5, rarely 2.

Ovary 1-celled; flowers in involucrate heads or short spikes; fruit an achene; herbs.....DIPSACEAE, p. 398.

- Ovary in ours 2-celled; flowers regular; fruit berry-like or dry, commonly separating into 2 one-seeded achene-like portions; leaves simple; herbs or shrubs.....RUBIACEAE, p. 392.
- Ovary 2 to 5-celled; flowers regular or irregular; leaves simple or compound; erect or twining shrubs.....CAPRIFOLIACEAE, p. 394.
- Stamens united into a tube around the style.
- Flowers not in heads; leaves alternate.
- Stamens 3; leaves palmately lobed; tendril-bearing herbs.....CUCURBITACEAE, p. 269.
- Stamens 5; leaves narrow; annual herbs.....LOBELIACEAE, p. 401.
- Flowers collected into a head which is furnished with a calyx-like involucre, the whole to the novice seeming like a single flower; stamens 5, rarely 4; fruit an achene.....COMPOSITAE, p. 403.

ABBREVIATIONS.

acc., according to.
Co., county; *cos.*, counties.
Erythea, a journal of botany.
ft., foot or feet.
in., inch or inches.

Muhl., Muhlenbergia, a journal of botany.
no., number.
Pt., point.
Zoe, a journal of botany.

Flora of Western Middle California

GYMNOSPERMS

Trees or shrubs with exogenous resinous stems, ours evergreen with linear, awl-like or scale-like leaves. Stamens and ovules borne separately, usually in catkins. Staminate catkin falling after maturity; pollen disseminated by wind. Ovulate catkin with the ovules borne naked on the surface of a scale, maturing into a woody cone. Cotyledons 3 to 17, rarely 2. Vegetative reproduction (stump sprouting) rare.

PINACEAE. PINE FAMILY.

Trees or shrubs. Leaves narrowly linear and alternate, or with bundles of needle-like leaves in the axils of scale-like (primary) leaves. Stamens and ovules in different catkins, usually on separate branches but always on same tree. Staminate catkins with numerous spirally arranged stamens, each bearing two pollen-sacs. Ovulate catkins with spirally arranged scales, each subtended by a distinct bract; ovules naked, 2 at the base of each scale on the upper side, maturing into seeds which commonly bear a wing derived from the surface tissue of the scale. Fruit a woody cone, the scales much enlarged, the bracts elongated and surpassing the scales, shorter than the scales, or minute.

Cones pendent or spreading, falling from the tree whole, the scales persistent.

Leaves of 2 kinds, needle-leaves in fascicles of 1 to 5 and scale-leaves; cones maturing the second autumn, their bracts minute1. PINUS.

Leaves of 1 kind, linear; cones maturing the first autumn, their bracts longer than the scales, notched at apex with a spear-like point in the notch....2. PSEUDOTSUGA.

Cones erect on branch, maturing the first autumn, their scales falling separately; leaf-scars smooth3. ABIES.

1. PINUS L. PINE.

Trees with two sorts of leaves, the primary leaves thin and scaly or chaff-like, bearing in their axils needle-shaped leaves, in fascicles of 1 to 5, which emerge from slender buds whose scarious scales sheathe the base of the cluster. Staminate catkins spreading, crowded in a whorl towards the base of the shoot of the same spring. Ovulate catkins erect, 1 to 5 in a sub-terminal whorl. Cones maturing in the second autumn, reflexed or pendulous, their scales woody, imbricated, the exposed portion often much thickened and bearing centrally an elevated sear or prickly boss (umbo). Cotyledons 4 to 17. (Latin name of the pine.)

Needles in 5s; cones long-stalked, pendulous, very long-oblong, 13 to 18 in. long; scale tips thin, unarmed1. *P. lambertiana*.

Needles in 3s. Cones breaking through near base when falling ("broken-cone" type).

Foliage green or yellow green; trunk persisting through crown as one main axis.

Cones ovate, 3 to 5 in. long; scale tips thickened, armed with a prickle2. *P. ponderosa*.

Cones long-ovate, 10 to 13 in. long; scale tips drawn out into highly developed talon-like spurs3. *P. coulteri*.

Foliage gray; trunk parting into several erect branches; cones round-oval, 6 to 10 in. long4. *P. sabiniana*.

Cones not breaking through near base, usually persistent and remaining closed for many years.

Foliage thin, pale yellow-green; cones narrow-ovate, 3 to 6 in. long.5. *P. tuberculata*.
 Foliage dense, dark green; cones broadly ovoid, $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long.6. *P. radiata*.
 Needles in 2s; cones broadly ovate, 2 to 3 in. long.7. *P. muricata*.

1. *P. lambertiana* Dougl. SUGAR PINE. Forest tree 60 to 180 ft. high; trunk 2 to 6 ft. in diameter, its brown or reddish bark 2 to 4 in. thick, roughly fissured longitudinally with the surface breaking down into small deciduous scales; needles in 5s, slender, 2 to $3\frac{1}{2}$ in. long; cones pendulous, borne on stalks at the ends of the branches, commonly in the very summit of the tree, very long-oblong, 13 to 18 in. long, 4 to 6 in. thick when opened; scale-tips thin, with terminal sear-like umbo; seeds 2 to 5 lines long with broad wings twice as long; cotyledons 13 to 16.

Sierra Nevada, in the main timber belt. Coast Ranges: Siskiyou southward to Snow Mt., Mt. Sanhedrin and Mt. St. Helena; Austin Creek to Buckeye Creek, Sonoma County; Santa Lucia Mts. High ranges of Southern California. The most splendid of all pines and one of the greatest charms of the Sierran forest. Wood very valuable, white, soft and straight-grained.

P. MONTICOLA Don. Silver Pine, or "Little Sugar Pine," is found in the Sierra Nevada at somewhat higher elevations than the Sugar Pine. Cones in clusters of 1 to 7, pendulous, 6 to 8 in. long, 1 to $1\frac{1}{4}$ in. in diameter when closed; scales very soft.

P. ALBICAULIS Engelm. Whitebark Pine is a timber-line tree in the Sierra Nevada. Branchlets very pliable; cones ovoid, small.

2. *P. ponderosa* Dougl. YELLOW PINE. Forest tree 60 to 225 ft. high, the trunk 2 to 8 ft. in diameter; bark 2 to 4 in. thick, tawny or yellow-brown, divided by fissures into large plates, or sometimes closely fissured; needles in 3s, 5 to 10 in. long; cones reddish brown, commonly 3 to 5 in. long, narrowly ovate when closed, roundish ovate or oval when open, after opening breaking through near the base and falling, leaving the basal scales on the limb; scales thickened or low-pyramidal at apex and bearing an umbo which is abruptly drawn down into a stout somewhat triangular point or short prickle; seeds ovate, 3 to 4 lines long, the wing broadest near the middle and tapering to apex, $\frac{3}{4}$ to 1 in. long and 4 to 6 lines broad; cotyledons 5 to 10.

Sierra Nevada, main timber belt, the most abundant species. Coast Ranges, mostly uncommon or absent; occurs sparingly in Santa Lucia, Santa Cruz and Mt. Hamilton ranges; abundant in the inner North Coast Ranges south to Snow Mt., thence but sparingly in scattered patches west to Willits, south to Healdsburg and Napa Valley. Wood valuable, straight-grained, rather resinous.

3. *P. coulteri* Don. BIG-CONE PINE. Tree 40 to 70 ft. high with usually spreading crown and long lower branches; bark dark, roughly broken; needles in 3s, erect, tipped with a short hard point, 5 to 10 (or 14) in. long; cones long-ovate, 10 to 13 in. long, 5 to $7\frac{1}{2}$ in. thick, when falling breaking through near the base like the cone of the Yellow Pine; scales at tip drawn out into prominent tusk-like points or spurs which towards the base of the cone on the outer side are developed into curving talon-like appendages; seeds 6 to 8 lines long with a wing twice or nearly twice as long; cotyledons 10 to 17.

Dry rocky mountain slopes, Mt. Diablo, Mt. Hamilton, San Carlos and Santa Lucia ranges and south to Southern California. Timber poor. The Mt. Diablo trees are towards the north base of the mountain near the village of Clayton. There are none in Pine Cañon nor in the upper part of Mitchell Cañon.

4. *P. sabiniana* Dougl. DIGGER PINE. Tree 40 to 50 (or 90) ft. high,

the trunk in typical trees parting into a cluster of erect branches which form a broom-like top; needles in 3s, drooping, 7 to 13½ in. long; cones on stalks 2 to 2½ in. long, ovate, subglobose when open, 6 to 10 in. long, 5 to 7 in. thick and only slightly unsymmetrical, when falling breaking through near the base and leaving the basal portion on the limb; tips of the scales strongly developed into triangular hooks projecting downwards, about 1 in. long; seeds hard-shelled, oblong, slightly flattened, 9 to 11 lines long, 4 to 5 lines wide, bearing a short wing 3 to 5 lines long and ½ in. broad; cotyledons 11 to 17.

Arid foothills, forming a very thin stand and usually growing by itself. Sierra Nevada foothills. Coast Ranges, most common towards the interior, rarely reaching the coast: Cloverdale, Healdsburg, Napa Valley, Vaca Mts., Mt. Diablo (a strongly spur-hooked form towards head of Mitchell Cañon), Mt. Hamilton and Santa Cruz ranges and southward. Timber inferior, highly resinous. On account of its scattered growth, manner of branching, thin, gray foliage and burden of massive cones it gives a singular aspect to the hot country which it favors.

P. MONOPHYLLA Torr. One-leaf Piñon. The well-known nut pine of the desert ranges, occurring also in Grand Cañon of the Tuolumne, South Kings and Kern. Needle 1 in a place.

5. *P. tuberculata* Gord. KNOB-CONE PINE. Tree 5 to 30 or 50 ft. high with thin crown and slender trunk; needles in 3s, 3 to 5 in. long; cones strongly deflexed, buff in color, narrowly ovate, oblique, acutely or bluntly pointed and somewhat curved, especially at tip, 3 to 6 in. long; scales moderately thickened at tip, except on the outside towards the base where they are raised into conspicuous rounded or pointed knobs; umbos small and contracted into slender usually deciduous prickles; seeds brownish black, ovate, 3 to 4 lines long, the surface minutely roughened; wings 9 to 12 lines long, 3 to 4 lines broad, broadest near the middle; cotyledons 5 to 8.—(*P. attenuata* Lemm.)

Barren or rocky slopes at medium altitudes, the localities few and widely scattered: Santa Lucia Mts.; Santa Cruz Mts.; Moraga Ridge; Mt. St. Helena, and elsewhere northward to the Siskiyou, eastward to Mt. Shasta and southward in the Sierra Nevada to Mariposa County. The cones persist on the trunk and long slender main branches, many (15 to 25) years, forming circles from near the base to the summit; even young trees are often full of cones. The seeds are seldom liberated except when the cones are partially burned in a forest fire. It is thus very interesting that a burned forest of Knob-cone Pine is promptly resown with its own seed.

6. *P. radiata* Don. MONTEREY PINE. Beautiful symmetrical tree or in age with flattened or broken top. 30 to 70 or 115 ft. high; trunk 1 to 4 ft. in diameter, the dark, hard bark roughly fissured; needles in 3s, or a few in 2s, 3 to 6 in. long; cones tan or cinnamon color, turned downward, sessile and unequally developed, broadly ovoid and bluntly pointed, or globose when open, 2½ to 4½ in. long; scales on the outer side toward the base conspicuously swollen at tip into a hemispherical tubercle or boss and armed with a prickle which usually weathers off; seeds black, minutely roughened on the surface, 3 lines long, bearing a broadly oblong brown wing 2½ to 3 times as long; cotyledons 5 to 7.—(*P. insignis* Dougl.)

Sea-coast, only in a few small scattered colonies: Año Nuevo (about half way between Pescadero and Santa Cruz); Monterey; Cambria, San Luis Obispo County; Santa Rosa, Santa Cruz and Guadalupe islands. Near Año Nuevo Bay Monterey Pine forms on the coast ridge a narrow belt 5 miles long. It is seated over the summit and upper part of the face of the cliffs, which rise 400

to 500 feet from the beach. It extends northward along the slopes to Green-oaks Ck. with narrow bodies following Finney, Año Nuevo and other creeks down to the vicinity of the sea. Southward it descends nearly to the floor of the cañon-valley of Waddell Creek, reappears on the opposite wall, follows the ocean ridge for about 2 miles and, crossing the ridge to the east slope, descends about half-way to Scott Creek. On this eastern slope the trees are associated with Redwood and Madroña. In no other colony is Monterey Pine associated with Redwood. At Monterey *Pinus radiata* forms a dense growth from Monterey town and Pt. Pinos to the Carmel River and south along the coast in scattering clumps as far as Malpaso Ck. (Jepson, Trees Cal., 76). At Cambria there are small bodies on the hills back of the village, but none, so far as known, at San Simeon Bay, which is commonly quoted as a station.

7. *P. muricata* Don. BISHOP PINE. Tree 40 to 80 ft. high, 1 to 3 ft. in trunk diameter; bark dark, roughly fissured longitudinally; needles in 2s, 4 to 6 in. long; cones broadly ovate, 2 to 3 in. long, almost as thick, or when open more or less globose, borne on the shoot in circles of 3, 4 or 5, gradually turned downward, developed more strongly on the outside towards the base and in consequence always one-sided; scale-tips rhomboidal, bearing a central pricklet with a broad base, or the highly developed scales towards the base on the outside standing out as very stout straightish or upwardly curving spurs; seeds black, sometimes mottled, the thin shell minutely roughened, $2\frac{1}{2}$ to 3 lines long; wing broadest above the middle, oblique at summit, 5 to 8 lines long, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines broad; cotyledons 4 to 7.

Low, swampy hills or flats or rocky slopes, always near the sea: Mendocino and Sonoma coasts; Pt. Reyes Peninsula; Monterey; San Luis Obispo, directly west near the ocean along Coon Ck. (I. J. Condit.)

P. CONTORTA Dougl., Beach Pine, occurs on the Mendocino Coast from Pt. Arena northward, as a low tree, 10 to 20 ft. high; bark dark, thick, roughly fissured. It may be readily distinguished from *P. muricata* by its shorter leaves (1 to $1\frac{1}{2}$ in. long, but also in pairs), and its much narrower cones of about the same length. *P. MURRAYANA* Balf. is the Tamrac Pine, or Two-leaf Pine, of the high Sierra Nevada; bark light gray, remarkably thin ($\frac{1}{4}$ in. thick). It is called *P. contorta* var. *murrayana* Engelm. by many botanists.

2. PSEUDOTSUGA Carr.

Large trees with flat short-petioled leaves spreading around the stem or on horizontal branches often somewhat 2-ranked. Staminate catkins axillary, the pollen-sacs tipped with a spur and opening obliquely. Ovulate catkins erect, terminal or axillary. Cones pendent, maturing in the first autumn, borne all over crown; scales thin, rounded, shorter than the slender acutely 2-lobed bracts which bear a spear-like point in the notch. Seeds without resin vesicles; cotyledons 5 to 12.—In botanical relationship it stands in an intermediate position among the Spruces, Hemlocks and Firs. Its peculiar cone bracts, signally different from those of any other conifer, and the obliquely dehiscing pollen-sacs are the chief marks of the distinctive genus *Pseudotsuga*. (Greek pseudos, false, and Japanese tsuga, hemlock.)

1. *P. taxifolia* BRILL. DOUGLAS FIR. DOUGLAS SPRUCE. Magnificent forest tree, 70 to 250 ft. high, the trunk 1 to 8 ft. in diameter; bark on old trees very thick, soft and putty-like, broken into broad, heavy furrows; branchlets with the leaves spreading all around the stem or on horizontal branchlets turned more or less to right and left but not in truly flat sprays; leaves linear, blunt at apex, flat with a median groove above and a ridge below, green, with two pale longi-

tudinal bands on the under surface, very short-petioled, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, $\frac{1}{2}$ to 1 line wide; cones cinnamon or red-brown, long-oval and more or less pointed, $1\frac{3}{4}$ to $3\frac{1}{2}$ in. long, when open $1\frac{1}{4}$ to $1\frac{3}{4}$ in. thick; scales broad and rounded at apex; bracts conspicuously exserted, broadly linear and bearing in the deep notch at apex a spear-like point; seeds 3 lines long, almost as long as the wings; cotyledons 5 to 8.—(*P. douglasii* Carr.)

Moist mountain slopes, especially northward: Santa Lucia and Santa Cruz ranges but absent from the Mt. Hamilton and Mt. Diablo ranges; occurs in Marin Co. and is more or less frequent or even common in the North Coast Ranges from Sonoma and Napa Valley northward; Sierra Nevada south to the San Joaquin River. Most abundant and reaching its greatest size in the crowded coast forests of Oregon, Washington and British Columbia where truly gigantic trees are found. In these northern woods it is known to woodsmen as Red Fir or Yellow Fir but when manufactured into lumber it is sold on the market under the trade-name, "Oregon Pine."

The two following genera have the bracts shorter than the scales:

PICEA Link. Spruce. Leaves sessile, jointed on the woody, peg-like base which spreads at right angles to the branchlet; trunk bark marked by scars of deciduous scales. *P. SITCHENSIS* Carr., Tideland Spruce, has very stiff, prickly-pointed leaves and cones 2 to 4 in. long.—Mendocino Coast and northward to Oregon and Washington, where it becomes a giant forest tree 10 to 20 feet in trunk diameter. *P. BREWERIANA* Wats., Weeping Spruce, with long, pendulous cord-like branchlets; grows in the high Siskiyou Mts.

TSUGA Carr. Hemlock. Leaves petioled, jointed on the woody base which is somewhat decurrent on the branchlet; trunk fissured or smoothish, not scaly. *T. HETEROPHYLLA* Sarg., Coast Hemlock, has the leaves in flat sprays and cones $\frac{1}{2}$ to 1 in. long.—Mendocino Coast and northward, a forest tree 90 to 180 feet high. *T. MERTENSIANA* Sarg., Mountain Hemlock, has the leaves spreading around the branchlet and cones $1\frac{1}{2}$ to 3 in. long.—Subalpine in the Sierra Nevada, a tree 20 to 90 ft. high.

3. *ABIES* Link. FIR.

Highly symmetrical trees of lofty stature, the branches in regular whorls and ramifying laterally, forming flat sprays. Leaves linear, flat, thickened or 4-angled, whitened beneath, spreading in 2 opposite directions or even 2-ranked, or more often curving upwards, leaving a smooth circular scar when they fall. Catkins from axillary winter buds. Staminate catkins borne on the under side of the branches, mostly in the upper half of the tree. Ovulate catkins erect, on the upper side of the topmost spreading branches. Cones erect, maturing in the first autumn, falling to pieces on the tree; scales thin, incurved at the broadened apex; bracts often exserted. Seeds with resin vesicles; cotyledons 4 to 10. (The Latin name.)

1. *A. grandis* Lindl. LOWLAND FIR. Forest tree 40 to 160 ft. high, the trunk $1\frac{1}{2}$ to 4 ft. in diameter; leaves flat, 1 to 2 in. long, notched at apex, dark lustrous green above and with a median channel, below with two white bands separated by a ridge; cones long-oblong in outline, $2\frac{1}{2}$ to 4 in. long, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. thick; scales with a broad rounded summit and narrow stalk-like base, broader than long; bracts small, with a short awl-like point set on the roundish apex, $\frac{1}{2}$ as long as the scales; seeds drab-color, $4\frac{1}{2}$ lines long with a wing somewhat longer and twice as broad as the seed; cotyledons 6.

Low hills or valleys near the sea: northern Sonoma, Mendocino, Humboldt and Del Norte cos., and north to southern British Columbia.

A. CONCOLOR Lindl. & Gord. White Fir. Old bark roughly and deeply furrowed, drab or grayish; leaves glaucous or dull green, flat or on cone-bearing branches keeled above, acute or rarely notched at apex, spreading in two ranks or curving upwards, with a twist in the short petiole; cones 2 to 5½ in. long, bracts not exerted.—High Sierra Nevada and Coast Ranges, 3800 to 6000 feet, a tree 60 to 150 ft. high.

A. MAGNIFICA Murr. Red Fir. Old bark deeply divided into roughly broken ridges, reddish brown; leaves thickened below and a little above so as to be subterete or somewhat 4-sided, thicker on the uppermost branches, curving upwards but not twisted, sessile; cones 4 to 8 in. long; bracts concealed or exerted.—High Sierra Nevada and Coast Ranges, 6000 to 9000 ft., a forest tree of great beauty, 60 to 175 ft. high.

A. VENUSTA Koch., Santa Lucia Fir, with long-exserted bristles to the cones.—Santa Lucia Mts.

TAXODIACEAE. REDWOOD FAMILY.

Trees with linear or awl-shaped alternate leaves. Staminate and ovulate catkins on the same tree. Staminate catkins small. Scales of the ovulate catkins spirally arranged, more or less blended with the bract, often spreading horizontally from the axis of the cone and developed into broad flattish summits. Ovules to each scale 2 to 9. Seeds not winged or merely margined.

1. *SEQUOIA* Endl. REDWOOD.

Tall trees with thick, red, fibrous bark and linear, awl-shaped, or scale-like leaves. Staminate catkins terminal on the branchlets or on short lateral branchlets, with many spirally disposed stamens, each bearing 2 to 5 pollen-sacs. Ovulate catkins terminal, composed of many spirally arranged scales, each with 5 to 7 ovules at base. Cone woody, its scales divergent at right angles to the axis, widening upward and forming a broad rhomboidal wrinkled summit with a depressed center. Seeds flattened; seed-leaves 2 to 6. (The Cherokee Indian, Sequoyah, who invented an alphabet for his tribe.)

1. *S. sempervirens* Endl. REDWOOD. Tall and massive forest tree 100 to 340 ft. high, the trunk 2 to 16 ft. in diameter; bark ¼ to 1 ft. thick; foliage reddish brown; leaves linear, spreading right and left so as to form flat sprays, ¼ to 1¼ (mostly ½ to ¾) in. long and 1 to 1¼ lines wide, or in the top of adult trees with short linear acuminate leaves 3 to 5 lines long, such branchlets strikingly suggestive of those of the Big Tree; cones oval, reddish brown, ¾ to 1¼ in. long and ¾ to ¾ in. thick, borne in clusters on the ends of branchlets mostly in the top of the tree, maturing in first autumn; scales 14 to 24; seeds narrowly margined, elliptic in outline, 2 lines long; cotyledons usually 2.

The Redwood is the most characteristic and abundant forest tree of the immediate coast region. It is seldom found 30 miles from the ocean, never ranging inland beyond the influence of the sea-fogs, and forms a narrow belt along the coast from southern Monterey Co. to the Oregon line. It is a common tree in the Santa Cruz Mts., where there is an especially fine grove famous as the "Santa Cruz Big Trees." In the Mt. Diablo Range the Redwood is not known except in one limited locality about Redwood Peak, in the Oakland Hills, directly opposite the Golden Gate. It occurs about Mt. Tamalpais and is abundant in Sonoma and Mendocino cos. In Napa Valley it is rather frequent and beyond the summit of Howell Mountain it descends the slope towards Pope Valley. It thus crosses at one point the divide of the North Coast Ranges and this locality

is the farthest from the ocean. The Redwood belt has here, consequently, its greatest width. It is the tallest tree on the American continent. In the forests near Scotia, a tree 662 years old, measured in September 1896, by C. S. Sargent, had a trunk diameter of 10 ft. 5 in., at 6 ft. above the ground, and was 340 ft. in height. Trunks from 15 to 20 ft. in diameter are not uncommon in the magnificent Redwood forests of Humboldt and Del Norte, and trees 20 to 25 ft. in diameter can be found. No other tree has been so important to the development of civilization in California because the wood, abundant and cheap, is exceedingly valuable for all sorts of building purposes and in manufactures and the arts. The region of this great coniferous forest is a very attractive one, regarded from almost any point of view, and delights the eye and mind of the tourist, as well as the botanical traveler.

S. GIGANTEA Dec. The Big Tree of the Sierra Nevada has awl-shaped leaves ascending all around stem and cones 2 to 3¾ in. long. (An account of the Big Tree groves may be found in Jepson, *Trees Cal.*, p. 103.)

CUPRESSACEAE. CYPRESS FAMILY.

Trees or shrubs with opposite or whorled scale-like (or rarely linear) leaves thickly clothing the ultimate branchlets. Stamens and ovules in separate catkins. Staminate catkins terminal on the branchlets, small, with shield-like stamens bearing 2 to 6 pollen-sacs. Ovulate catkins consisting of several opposite or whorled scales which bear at base 1 to several erect ovules. Cones woody or in *Juniperus* fleshy, consisting of few "scales"; "scales" imbricated or shield-shaped, consisting morphologically of a completely blended scale and bract.

Branchlets flattened, disposed in one plane; leaves in 4 rows, the successive pairs unlike; cones with overlapping scales, seeds 2 to each scale, unequally 2-winged. . . . 1. *LIBOCEDRUS*.
Branchlets cord-like; leaves in 3 or 4 rows; cones subglobose, their scales peltate (not overlapping).

Fruit a woody cone, its seeds many; stamens and ovules on same tree; leaves in 4 rows. 2. *CUPRESSUS*.

Fruit a berry, its seeds 1 to 3; stamens and ovules on different trees; leaves in whorls of 3 or opposite 3. *JUNIPERUS*.

1. *LIBOCEDRUS*. Endl.

Aromatic trees with flattened branchlets disposed in one plane. Leaves scale-like, opposite, imbricated in 4 rows, the successive pairs unlike. Staminate and ovulate catkins terminal on separate branchlets. Staminate catkins with 12 to 16 decussately opposite stamens, each with 4 to 6 pollen-sacs. Ovulate catkins consisting of 4 to 8 scales, only one pair ovule-bearing, each scale of this pair with 2 ovules at base. Cones maturing in first autumn, oblong, composed of imbricated oblong scales. Seeds unequally 2-winged; cotyledons 2. (Greek *libas*, referring to the trickling of the resin, and *kedros*, cedar.)

1. *L. decurrens* Torr. INCENSE CEDAR. Forest tree 50 to 125 ft. high with conical trunk 2 to 7 ft. in diameter; bark cinnamon, loose or fibrous in age; leaves minute, 1 to 3 lines long, coherent, also adherent to the stem, free only at the tips, those above and below obtuse but minutely pointed and forming a pair overlapped by the keel-shaped lateral pair; cones red-brown, oblong-ovate when closed, ¾ to 1 in. long, consisting of 2 seed-bearing scales with one septal scale between them and often with 2 small scales at base; seed-bearing scales broad and flattish but not thin; all the scales with a small triangular umbo at tip; seeds 4 lines long, margined on each side from near the base to the apex by two very unequal wings; larger wing ovate, about 6 lines long.

Sierra Nevada, with Yellow Pine, Sugar Pine and White Fir one of the four most abundant trees in the main timber belt. Coast Ranges, rather uncom-

mon: Santa Lucia, San Carlos and Mt. Hamilton ranges; Mt. St. Helena and north to Mt. Shasta. Wood very durable. When the cone is dead ripe the septal scale usually separates partially into 3 scales; these scales are quite distinct in the young catkin and the central scale is then seen to consist of a completely blended reduced pair. The ovulate catkin consists, therefore, of 4 pair of scales, the first pair barren, the second pair ovule-bearing, the third and fourth pair becoming in fruit completely united to form the "septal scale."

2. CUPRESSUS L. CYPRESS.

Trees or shrubs. Leaves scale-like, small, appressed, closely imbricated in four ranks on the ultimate cord-like branchlets, or awl-shaped on vigorous shoots. Staminate catkins terminal on the branchlets with 3 to 5 pollen-sacs to each stamen. Ovulate catkins on short lateral branchlets, the ovules numerous, erect, in several rows at the base of the scales. Cones globose to oblong, maturing in the second year, the shield-shaped scales fitting closely together by their margins, not overlapping, separating at maturity, their broad summits with a central boss or short point. Seeds acutely angled or margined; cotyledons 2 to 5. (Classical name of the Cypress.)

Umbos small and low.

Branchlets slender, squarish1. *C. goveniana*.
Branchlets thickish, terete2. *C. sargentii*.
Umbos prominent, the two uppermost horn-like and incurved; leaves with conspicuous resin pits3. *C. macnabiana*.

1. *C. goveniana* Gord. GOWEN CYPRESS. Shrub, compactly branched, 5 to 15 ft. high; foliage yellowish; ultimate branchlets very slender, squarish, their leaves rarely with pits or lateral depressions; cones light brown, subglobose or oval, 6 to 8 lines long, rarely longer, with 4 pair of scales; umbo short, crescent-like; seeds commonly black, sometimes brown but not red, angular or acutely margined, minutely warty, 1 to 1½ lines long.

Monterey, in the forest of *Pinus radiata* on the west slope of the Pt. Pinos ridge. Often bearing cones when only one foot high in a manner similar to the form of the Mendocino White Plains (*C. pygmaea* Sarg.), which also has black seeds (less obviously warty) and leaves with few or no pits.

2. *C. sargentii* Jepson. Shrub or tree, with larger red or reddish brown often glaucous seeds; leaves more commonly pitted; branchlets thickish, terete; cones 8 to 11 lines long.

Red Mt., Mt. Tamalpais, Cedar Mt. and near Bonny Doon.

C. MACROCARPA Hartw., Monterey Cypress, is restricted to the sea-cliffs at the mouth of the Carmel River near Monterey.

3. *C. macnabiana* Murr. MACNAB CYPRESS. Shrub or small tree, commonly 6 to 8 but even 35 ft. high; branchlets very slender; leaves with a conspicuous resin pit or white gland on the back towards the apex, often slightly glaucous; cones globose, clustered, short-peduncled, 5 to 8 lines in diameter, reddish or grayish brown; scales 6 to 8, with strong conical umbos, the uppermost very prominent or horn-like and incurved; seeds brown.

Dry hills or flats: North Coast Ranges from Samuels Springs, Mt. Aetna, Red Mt., and Bartlett Creek north to Whiskeytown (Shasta Co.). Foliage blue-green, pungently aromatic.

3. JUNIPERUS L. JUNIPER.

Trees or shrubs. Leaves in whorls of 3 or opposite, scale-like, imbricated, closely appressed and adnate to the branchlets, or linear-subulate and spread-

ing. Stamens and ovules on separate trees. Staminate catkins with many stamens, each with 2 to 6 pollen-sacs. Ovulate catkins of 3 to 6 succulent coalescent scales, each bearing 1 or 2 ovules. Cones fleshy and berry-like, ripe in the second year; in ours 1 to 3-seeded; cotyledons 2 to 6. (Ancient Latin name.)

1. **J. californica** Carr. CALIFORNIA JUNIPER. Shrub or low tree 5 to 15 ft. high; leaves in 3s, ovate, acute, each with a dorsal pit towards the base, crowded on the ultimate branchlets or occasionally free and subulate, $\frac{1}{2}$ to 1 line long; berries reddish or brownish, covered with a dense white bloom, subglobose or oblong, $\frac{1}{4}$ to $\frac{1}{2}$ lines long, with dry fibrous sweet flesh and 1 to 3 seeds; seeds ovate, acute, brown, with a thick smooth but angled or ridged polished bony shell, 3 to $5\frac{1}{2}$ lines long; cotyledons 4 to 6.

Dry hills or mountain sides. Local in the region northerly and westerly from Clear Lake; Mt. Diablo; south of Hollister to Southern California; Tehachapi Mts. to Kernville; Coulterville.

J. OCCIDENTALIS Hook., Sierra Juniper, is common at 6,000 to 10,000 ft. in the Sierra Nevada; berries smaller, blue-black, the flesh juicy; seeds 1 to 4, cotyledons 2.

TAXACEAE. YEW FAMILY.

Trees or shrubs with linear leaves 2-ranked by a twist in their petioles. Stamens and ovules borne on different trees and appearing in early spring from axillary scaly winter buds. Stamens united by their filaments into a column with 4 to 8 pollen-sacs pendent from each filament. Ovule solitary, terminal on a short axillary branch. Seeds set loosely in a fleshy cup, or quite enveloped by it and thus appearing drupe-like, ripe in first autumn; cotyledons 2.

Fruit red, berry-like; leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. long, acute.....1. **TAXUS**.

Fruit green or purplish, plum-like; leaves $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long, stiffish, bristle-pointed. 2. **TORREYA**.

1. **TAXUS L. YEW.**

Trees or shrubs, the leaves bluntish or merely acute. Stamens 7 to 12 in a cluster, the 4 to 9 pollen-sacs borne under a shield-like crest. Ovule seated upon a circular disk which in fruit becomes cup-shaped, fleshy, and red, surrounding the bony seed, the whole berry-like. (Ancient Latin name of the yew, probably from Greek toxon, a bow, the wood used for bows.)

1. **T. brevifolia** Nutt. WESTERN YEW. Small tree 10 to 30 ft. high, the crown irregular with the branches of unequal length and standing at various angles but tending to droop; bark thin, red-brown, shreddy; leaves linear, acute at apex, shortly petioled, flat, with midrib in relief above and below, 3 or mostly 6 to 8 lines long, 1 line wide, spreading right and left in flat sprays; seeds borne on the under side of the sprays and when mature set in a fleshy scarlet cup, the whole looking like a brilliantly colored berry.

Deep, shady cañons: Santa Cruz Mts.; Mt. St. Helena; Mendocino Co. (Laytonville, Sherwood) and northward to Mt. Shasta, thence south through the Sierra Nevada. Localities few and scattered, and the individuals not numerous. Wood fine and close-grained, hard, heavy and durable.

2. **TORREYA** Arn. STINKING YEW.

Trees with rigid sharp-pointed leaves in 2 ranks. Stamen clusters solitary in the adjacent leaf axils, borne on 1-year-old branches, made up of 6 to 8 whorls of stamens, 4 stamens in a whorl, each filament with 4 pollen-sacs without crests. Ovule completely covered by a fleshy aril-like coat, the whole becom-

ing drupe-like in fruit. Seed with thick, woody outer coat, its inner layer irregularly folded into the white endosperm; embryo minute. (John Torrey, Professor of Botany in Columbia College, long-time a student of western botany, who traveled in California before the days of the Overland Railroad.)

1. *T. californica* Torr. CALIFORNIA NUTMEG. Handsome tree 15 to 50 ft. high, the trunk $\frac{1}{2}$ to 3 ft. in diameter; leaves rigid, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long, $1\frac{1}{2}$ lines wide, flat, dark green above, yellowish green beneath and with two longitudinal glaucous grooves, linear or tapering above middle, bristle-tipped, twisted on their short petioles so as to form a 2-ranked flat spray; stamens clusters whitish, globose, about 3 lines long, crowded on the under side of the branches; fruit elliptical, green in color or when ripe streaked with purple, $1\frac{1}{8}$ to $1\frac{3}{4}$ in. long; flesh thin and resinous; shell of the seed more or less longitudinally grooved; endosperm copious, with irregular incisions filled by the inner coat, giving it a marbled appearance so that in cross-section the seed resembles the true nutmeg of commerce.—(*Tumion californicum* Greene.)

Cool, shady cañons: Santa Cruz Mts.; Marin, Sonoma, Napa, Lake and Mendocino cos.; Sierra Nevada. A forestally rare tree yet its altitudinal range is considerable; it grows on Papermill Ck. (Marin Co.) near sea-level and on Buck Ck., Middle Fork Kaweah River (southern Sierra Nevada) at 6000 ft.

ANGIOSPERMS

Trees, shrubs or herbs. Sexual reproductive organ called a flower, typically consisting of an abbreviated axis bearing regular circles of calyx and corolla parts, stamens and pistils. Calyx or corolla or both often absent, and stamens and pistils often in different flowers. Ovules always enclosed in a sac (ovary).

MONOCOTS

Leaves parallel-veined. Stems with the vascular bundles scattered irregularly through them, without central pith or concentric woody layers. Flowers with the parts usually in 3s or 6s, never in 5s. Embryo with one cotyledon. Our species all herbs.

TYPHACEAE. CAT-TAIL FAMILY.

Marsh or aquatic perennial herbs, the solid cylindric jointless stems from creeping rootstocks and bearing long linear alternate leaves. Flowers monocious, in dense spikes, without perianth. Stamens and ovaries with bristles or minute scales intermixed. Ovary 1-ovuled, with a slender style, becoming in fruit a seed-like nut. Embryo straight, embedded in copious endosperm.

1. TYPHA L. CAT-TAIL.

Stems tall, simple, ending above in a long spike, the pistillate portion below merely contiguous to or quite separated from the staminate portion above. Stamens intermixed with hairs, their filaments connate. Ovaries minute, stipitate; stipes bearing bristly hairs which envelope the very small nuts in a copious down. (Ancient Greek name of the Cat-tail.)

1. *T. latifolia* L. CAT-TAIL. Stout, $3\frac{1}{2}$ to 6 ft. high; leaves very long, sheathing at the base; spike 7 to 13 in. long, the pistillate portion below contiguous to the staminate portion above; pistillate portion dark brown, at length 1 in. thick; staminate portion yellow, rather thicker when in flower, but soon deciduous, leaving a bare axis.

Common in marshes and marshy places by creeks: Coast Ranges, lower Sacramento and lower San Joaquin.

SPARGANIACEAE. BUR-REED FAMILY.

Marsh or aquatic plants with terete stems from creeping rootstocks, alternate long-linear 2-ranked leaves and monoecious flowers in globose heads. Fruit obovoid or spindle-shaped, 1 to 2-seeded.

1. SPARGANIUM L. BUR-REED.

Heads scattered along the upper portion of the simple or sparingly branched stem; lower heads pistillate, with leaf-like bracts; upper heads staminate. Stamens with minute scales interposed, their filaments slender and elongated. Ovaries surrounded by 3 to 6 linear-subulate scales forming a sort of calyx. (Sparganium, the Greek name, diminutive of sparganon, a swaddling-band, on account of the ribbon-like leaves.)

Pistillate heads 2 on a branch, always sessile; nuts 2 lines wide or less ..1 *S. greenii*.
Pistillate heads 2 to 4 on a branch, peduncled or less commonly sessile; nuts mostly 3 lines wide2. *S. eurycarpum*.

1. *S. greenii* Morong. Stems 2 to 5 ft. high; leaves triangular, channeled, partly clasping at base and flattened towards the apex, $\frac{1}{2}$ in. wide; inflorescence branching 7 to 16 in. long; pistillate heads 1 or 2 on a branch, sessile, in fruit 1 in. broad; staminate heads 10 to 17 on a branch; nuts broadly cuneate, rounded at summit and with a short beak, obviously but not sharply angular, 4 lines long, 2 (or rather less than 2) lines wide.

Olema, Marin Co.; Butano Creek, San Mateo Co. Aug. Fruiting in Oct.

2. *S. eurycarpum* Engelm. Erect, rather slender, 3 to 8 ft. high, with branching inflorescence; leaves flat and thin, slightly keeled beneath; pistillate heads 2 to 4 on the stem or branch, sessile or more commonly peduncled; staminate heads 5 to 13; heads in fruit $\frac{3}{4}$ to $1\frac{1}{4}$ in. in diameter; nuts obovate, many-angled, with a broad rounded or hemispherical summit, tipped with the short style, 3 (or nearly 3) lines broad, 4 lines long, including the style.—(*S. californicum* Greene.)

Calistoga, lower Sacramento and southward to Santa Clara Co. June-July.

NAIADACEAE. PONDWEED FAMILY.

Water plants entirely submerged or with floating leaves. Leaves thread-like or grass-like or some with broad floating blades, commonly sheathing at base or with sheathing stipules. Flowers inconspicuous, naked or with a very small calyx, commonly borne on a short spike or spadix. Ovaries 1 to 4, distinct, free from the calyx if that be present, 1-celled, 1-ovuled, ripening into nutlet-like fruits.

A. Flowers perfect; calyx present.

Sepals 4, distinct1. POTAMOGETON.
Sepals none2. RUPPIA.

B. Flowers monoecious or dioecious; calyx none.

Leaves with spiny-toothed margins; pistil solitary and naked3. NAIAS.
Leaves entire.

Pistils about 4, borne in a cup-shaped involucre; fresh water ponds or streams
4. ZANNICHELLIA.

Pistils many, borne on the side of a linear spadix; maritime.

Flowers monoecious; fruit ovoid; leaves 2 to 4 lines broad5. ZOSTERA.

Flowers dioecious; fruit sagittate-cordate; leaves $\frac{1}{2}$ to 2 lines broad.....
6. PHYLLOSPADIX.

1. POTAMOGETON L. PONDWEED.

Perennial herbs, commonly growing in the still waters of creeks and in fresh or brackish ponds, the stems arising from rootstocks. Leaves alternate, or the

uppermost opposite, frequently of two kinds, the floating ones broad, the submerged narrower and often thread-like or linear; stipules present, often sheathing the stem. Flowers in spikes or heads, which are borne on axillary peduncles and enclosed in the bud by stipular sheaths. Sepals 4, with short claws. Stamens 4, inserted on the base of sepals. Ovaries 4. (Greek potamos, a river, and geiton, a neighbor, on account of the aquatic habit.)

A. Stipules axillary and free from the leaf.

Plants with both submerged and floating leaves; submerged leaves linear or lanceolate, bearing true blades.....1. *P. americanus*.

Plants with leaves all submerged.

Leaves with broad blades.....2. *P. lucens*.

Leaves very narrow, thread-like or setaceous.

Without propagating buds or glands.....3. *P. foliosus*.

With both propagating buds and glands.....4. *P. pusillus*.

B. Stipules adnate to the leaf or petiole; submerged leaves only.

Leaves capillary.....5. *P. pectinatus*.

Leaves flat, $\frac{1}{2}$ to $1\frac{1}{2}$ lines broad.....6. *P. latifolius*.

1. *P. americanus* C. & S. Stems terete, much branched, 3 to 6 ft. long; floating leaves coriaceous, elliptical, 2 to 4 in. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. wide, the petiole often longer than the blade, submerged leaves very thin, lanceolate, 4 to 12 in. long, 4 to 6 lines broad, rounded at base, or tapering into a petiole 1 to 4 in. long; stipules 1 to 4 in. long; peduncles 2 to 3 in. long; spikes 1 to 2 in. long, densely fruited; nutlets obliquely obovate, $1\frac{1}{2}$ to 2 lines long, the back 3-keeled, with the middle keel prominent.—(*P. lonchites* Tuckerm.)

Ponds or slow creeks in the valleys or hills at low altitudes: California, Washington and the Atlantic States.

2. *P. lucens* L. Stem thick, branching below and bearing masses of very leafy branches at summit; leaves all submerged, thin, elliptical to lanceolate or oblanceolate or the uppermost oval, acute or acuminate, often undulate-serrate, narrowed at base to a short petiole or sessile, 2 to 7 in. long and $\frac{3}{4}$ to $1\frac{3}{4}$ in. wide; stipules greenish, 1 to 2 in. long, loose and spreading, sometimes very broad; peduncles 3 to 6 in. long; spikes 2 to $2\frac{1}{2}$ in. long, thick cylindrical; nutlet $1\frac{1}{2}$ lines long, nearly as broad, with 3 distinct ribs on back.

Small lakes and ponds: San Francisco Peninsula to Southern California; also far eastward beyond our border.

3. *P. foliosus* Raf. LEAFY PONDWEED. Stem flattened, much branched, 1 to $2\frac{1}{2}$ ft. high; leaves rather thickly clothing the stem, 1 to $1\frac{1}{2}$ in. long, $\frac{1}{2}$ to 1 line wide, abruptly acute; stipules white, transparent, 6 to 9 lines long; flowers few in a head on a peduncle 2 to 6 lines long; fruit nearly 1 line long, 3-keeled on the back, the central keel with narrow rough-edged wing.—(*P. pauciflorus* Pursh.)

Gilroy; San Francisco; Mariposa, Congdon; Birds Landing, Jepson; Shasta Co., Baker, northward into Oregon and far eastward.

4. *P. pusillus* L. SLENDER PONDWEED. Stems filiform, branching, $\frac{1}{2}$ to 1 ft. long; leaves narrowly linear or often nearly setaceous, with a crater-like gland on each side of the stem at base of the petiole or rarely glandless, 1 to 3 in. long, $\frac{1}{4}$ to $\frac{3}{4}$ line wide, sessile; stipules short, obtuse, becoming setose; peduncles flattened, slender, $\frac{1}{2}$ to 3 in. long; spikes interrupted or capitate; nutlet obliquely elliptical, $\frac{3}{4}$ to 1 line long, with a groove on each side of the rounded back, or sometimes with 3 distinct keels, beaked by a short style.

Santa Cruz, San Francisco, and Sierra Nevada (acc. Bot. Cal.), to Oregon and eastward to the Atlantic States.

5. **P. pectinatus** L. FENNEL PONDWEED. Stems $\frac{1}{2}$ or 2 to several feet long, arising from a running rootstock, repeatedly forking above, then very leafy and forming broom-like clusters; leaves setaceous, 1 to 3 in. long exclusive of the sheaths which are $\frac{1}{2}$ to $\frac{3}{4}$ in. long or on the lower leaves even 2 in. long; scarious margin of the sheaths very narrow; spikes $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, the flowers in distinctly separated whorls; peduncles 1 to 3 or more in. long; nutlet $1\frac{1}{2}$ to 2 lines long, with an obscure ridge on each side of the back.

The most common species throughout California from sea-level to 7000 ft. alt., species of world-wide distribution. The rootstocks imbedded in the mud of ponds bear tubers about the size of a pea. The deep-diving ducks, such as the Canvas-back and Broad-bill feed upon these sweet, nutritious tubers, pulling loose at the same time more or less of the tender rootstocks and the attached stems which float to the surface and are shared with the surface-feeding species like the Teal and Mallard. It is to this plant that the Canvas-back, while living in the salt-marshes, owes the succulent and nutty flavor of its flesh, making it in the eyes of sportsman and epicure superior to every other kind of wild-fowl.

6. **P. latifolius** Morong. Near the preceding; stems stoutish, white, branching; leaves numerous, fascicled terminally, $\frac{1}{2}$ to $1\frac{1}{2}$ lines broad; adnate portion of stipule $\frac{1}{4}$ to 1 in. long, broad on the uppermost leaves, scarious-margined, the free portion shorter.

Brackish water: Gilroy; Amedee, Lassen Co., *Davy*, to Oregon.

2. RUPPIA L. DITCH-GRASS.

Immersed aquatic herbs with long filiform forking stems. Leaves almost capillary, with a broad membranous sheathing base. Peduncles slender, axillary, at first very short and enclosed in the spathe-like base of the leaf, each bearing two flowers disposed near together and rising to the surface in the period of anthesis, afterwards coiling and drawing the fruits beneath the water. Flowers perfect, entirely destitute of perianth. Stamens 2, sessile, each anther consisting of 2 large and separate anther-cells. Pistils 4, after flowering becoming stalked; stigmas depressed, sessile. (H. B. Ruppian, a German botanist of the 18th century.)

1. **R. maritima** L. DITCH-GRASS. Plants 2 to 3 ft. long; leaves 2 to 3 in. long; pistils ripening into hard ovoid nuts, which at maturity are $\frac{3}{4}$ to $1\frac{1}{4}$ lines long, and raised on stipes 1 to 12 lines long; fruiting peduncle 3 to 6 lines long.

Alkaline or brackish waters: Southern California northward through the State. Cosmopolitan.

3. NAIAS L. NAIAD.

Slender branching submerged fresh-water plants with linear opposite spiny-toothed leaves, which are seemingly whorled on account of the ones crowded in the axils. Flowers unisexual, solitary in the axils. Staminate flower consisting of a single stamen enclosed by two perianth-like envelopes. Pistillate flower consisting of a single ovary bearing a style with 2 to 4 stigmas. Fruit a seed-like nutlet, tipped with the persistent style. (Greek Naias, a water-nymph.)

Leaves coarsely toothed, the sheathing base entire or with 1 or 2 teeth on each side 1. *N. marina*.

Leaves very minutely serrulate.

Nutlet shining, smooth; sheathing base of leaves with many minute teeth on its upper portion 2. *N. flexilis*.

Nutlet dull, reticulated; sheathing base of leaves commonly narrow and with few teeth or sometimes entire.....3. *N. guadalupensis*.

1. *N. marina* L. HOLLY-LEAVED NAIAD. Stems stout, often armed with prickles twice as long as their breadth; leaves linear, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, 1 to $1\frac{1}{2}$ lines broad, coarsely saw-toothed, with the teeth spinulose-tipped and the broad sheathing base entire or with 1 or 2 teeth on each side; nutlet 2 to $2\frac{1}{2}$ lines long, reticulated.—(N. major All.)

Clear Lake to Lower California and the Atlantic States.

2. *N. flexilis* R. & S. SLENDER NAIAD. Stems slender; leaves narrowly linear, very minutely toothed, mostly acuminate, $\frac{1}{2}$ to 1 in. long, $\frac{1}{4}$ to $\frac{1}{2}$ line wide; nutlet oblong-ovoid, 1 to 2 lines long, nearly smooth, shining.

Southern California to Washington, eastward to the Atlantic and in Europe.

3. *N. guadalupensis* (Spreng.) Morong. Stems thread-like, 1 to 2 ft. long; leaves 6 to 9 lines long, $\frac{1}{2}$ line wide or something less, abruptly acute; nutlet cylindrical, 1 to $1\frac{1}{2}$ lines long, dull but distinctly marked with numerous rows of squarish reticulations.

Oregon to San Francisco and southeastward to the Atlantic.

4. ZANNICHELLIA Mich.

Immersed aquatic plants, flowering and fruiting under water, the thread-like stems from a creeping rootstock. Leaves opposite or in whorls. Flowers monoecious, without perianth, sessile, both kinds in the same axil: staminate flowers consisting of an anther on a pedicel-like filament; pistillate flowers 2 to 6 in a cluster and surrounded by a hyaline cup-shaped involucre shorter than the pistils, each flower consisting of a single pistil with a thin peltate stigma on the summit of the short style. Fruit an oblong somewhat flattened, beaked nutlet. (Zannichelli, 1662-1729, a botanist of Venice.)

1. *Z. palustris* L. HORNED PONDWEED. Stems sparingly branched, 1 to $1\frac{1}{2}$ ft. long; leaves 1 to 2 in. long, filiform but flat; pistils usually 4, in fruit slightly incurved, becoming stipulate, 1 to $1\frac{1}{2}$ lines long, often roughened or toothed on the back.

Pools and still waters of streams: Southern California to the Sacramento Valley. Cosmopolitan.

5. ZOSTERA L. GRASS-WRACK.

Submerged maritime herbs with elongated and very narrow grass-like radical leaves and inflorescences raised on peduncle-like stems. Flowers monoecious, borne in 2 rows on the face of a flattened spadix with or without small lateral appendages covering them in the bud and closely invested by a protecting foliaceous spathe until anthesis. Staminate flower of 1 stamen. Pistillate flower of 1 pistil. Nutlet ovoid. (Greek zoster, a girdle or band, on account of the ribbon-like leaves.)

1. *Z. marina* L. EEL-GRASS. Leaves with long sheathing bases, 3 to 7-nerved, 1 to 4 ft. long, 1 to 4 lines broad; fruiting leaves jointed at base of spathe, which terminates with a more or less elongated leaf-like summit; spadix 2 to 4 in. long, 10 to 20 fruited; fruits $1\frac{1}{2}$ lines long, the ribs of the seed showing clearly on the pericarp.

Shoal waters of bays, San Pedro north to Alaska. Var. LATIFOLIA Morong. Stem stout, sometimes 8 or 10 ft. long; leaves 3 to 6 lines wide; nutlet with a distinct stipe, the pericarp splitting along the face.—Santa Barbara northward to Puget Sound, acc. Morong (*Z. pacifica* Wats.).

6. PHYLLOSPADIX Hook.

Aquatic plants of ocean shores, closely related to the preceding, with elongated narrowly-linear radical leaves from much branched creeping rootstocks. Flowers dioecious, borne in 2 rows on the side of a flattened spadix, with a lateral chartaceous appendage covering each flower in the bud, the whole inflorescence enclosed by a spathe which is produced beyond the spadix as a foliaceous prolongation. Anthers sessile. Pistil simple, with 2 stigmas; ovary sagittate-cordate, *i. e.*, with two downwardly-produced horns at base, which in fruit are strongly developed and bear on the inside deflexed bristles serving to attach the floating achenes to other plants on the beaches. (Greek phullon, leaf, and spadix, a kind of inflorescence. Cf. Gibbs, *Am. Nat.* xxxvi, 101. The pistillate spadices have rudimentary anther-cells. For fire-proofing and deadening the plants have been used as a filling between walls in construction.)

Flowering stems 1 ft. long or more, bearing 2 to 5 pistillate spadices1. *P. torreyi*.
Flowering stems 2 or 3 in. long, bearing 1 pistillate spadix or rarely 2.....2. *P. scouleri*.

1. *P. torreyi* Wats. TORREY'S EEL-GRASS. Rootstocks brittle; leaves $1\frac{1}{2}$ to 2 ft. long, $\frac{1}{2}$ to 1 line broad; pistillate spadices 1 to $1\frac{3}{4}$ in. long; staminate spadices shorter and with shorter peduncles; mature fruit $2\frac{1}{2}$ lines long.

Low tide limits to two fathoms below, San Diego and northward.

2. *P. scouleri* Hook. PACIFIC EEL-GRASS. Very similar to the preceding but the leaves rather broader, $\frac{3}{4}$ to 2 lines wide, and more obviously 3-nerved; fruits larger.

Santa Barbara and northward.

JUNCAGINACEAE. ARROW-GRASS FAMILY.

Marsh or sub-aquatic herbs with basal rush-like or grass-like leaves, and small flowers in racemes or spikes, or solitary. Calyx when present, 4 to 6-parted, its sepals in two series. Stamens in ours 6 or 1. Ovaries 1, or 3 to 6 and united. Embryo straight.

Flowers perfect, in a raceme; calyx present; stamens 6.....1. TRIGLOCHIN.
Flowers polygamous, in a spike, also with some solitary; calyx none; stamen 1..2 LILAEAE.

1. TRIGLOCHIN L.

Perennial by means of short rootstocks. Leaves fleshy with membranous sheaths. Flowers small, in a spike-like bractless raceme raised on a scape. Sepals 6, greenish, deciduous, the three inner inserted higher. Stamens in ours 6; anthers sessile or nearly so. Pistils in ours commonly 6 (rarely 3 to 5), their ovaries united around a central axis, splitting when ripe into 1-seeded carpels, which separate from the base upward, and leave a slender persistent axis. Stigmas as many as the ovaries, plumose. Carpels dehiscing by the ventral suture. (Greek tri, three, and glochis, a point, referring to the fruit of the 3-carpeled species.)

Scapes stout; leaves 2 lines wide or more1. *T. maritima*.
Scapes slender; leaves almost wiry, less than 1 line wide.....2. *T. concinna*.

1. *T. maritima* L. COMMON ARROW-GRASS. Terminal portion of the rootstock covered with the sheaths of old leaves; scapes stout, 1 ft. long or somewhat more, bearing a raceme 10 to 15 in. long, the whole surpassing the (2 to 3 lines wide) leaves; flowers 1 line long, longer than the pedicels, these in fruit conspicuously decurrent; carpels 3-angled, with the dorsal angles winged, making a broad longitudinally-striate groove on the back, $2\frac{1}{2}$ lines long, the stigmas persistent and recurved; seed narrowly linear, 1 line long.

Marshy shores along the coast.

2. **T. concinna** Davy. SLENDER ARROW-GRASS. Scapes very slender and racemes looser than in the preceding, 7 to 13 in. high; leaves usually less than 1 line wide; flowers about $\frac{1}{2}$ line long; carpels rather less than 2 lines long; fruiting pedicels less obviously decurrent.

With the preceding.

2. LILAEA H.B.K.

Sub-aquatic annual with fibrous roots and basal rush-like leaves sheathing at base. Flowers in spikes raised on scapes and also with solitary pistillate flowers in the axils of the basal leaves. Spikes unisexual or with perfect flowers in the middle, pistillate below and staminate above, all in the axils of bracts except the pistillate. Staminate flowers consisting of a single stamen. Perfect flowers made up of a stamen and a pistil. Pistillate flowers consisting of a single pistil with short style, those in the axils of the basal leaves with extraordinarily long styles. Fruits coriaceous, flattish, oblong-ovate, winged, longitudinally ribbed, 1-seeded, indehiscent, those in the axils of the basal leaves less compressed and wingless.

1. **L. subulata** H.B.K. Leaves cylindrical, 6 to 8 in. long, 1 to 2 lines in diameter, tapering to a point; spikes dense, $\frac{1}{2}$ in. long or less; basal pistillate flowers often with a style 1 to 3 in. long, their fruits larger than those of the spike, $2\frac{1}{2}$ to 3 lines long.

In water or mud of shallow vernal pools, British Columbia, coast region of middle California (where it is common) to Southern California.

ALISMACEAE. WATER-PLANTAIN FAMILY.

Marsh or aquatic herbs with radical leaves, scape-like flower stems and perfect or unisexual flowers. Perianth of 3 outer herbaceous persistent sepals, and 3 inner white deciduous petals. Stamens 6 or numerous. Ovaries numerous, distinct, 1-celled, 1-ovuled, becoming achenes in fruit. Endosperm none; embryo strongly recurved or folded.

Stamens 6; achenes in a single whorl.....1. ALISMA.
Stamens numerous; achenes in a dense head.

Flowers unisexual.....2. SAGITTARIA.

Fertile flowers with stamens.....3. LOPHOTOCARPUS.

1. ALISMA L.

Erect herbs, growing in shallow water or mud, with radical long-petioled leaves. Inflorescence a panicle consisting of whorled branches each bearing a simple or compound umbel of perfect flowers. Perianth of 3 outer small herbaceous segments, and 3 much larger inner ones, these petal-like and very delicate. Stamens 6, with short filaments. Ovaries distinct on a disk-like receptacle. Achenes numerous, channeled on the back, crowded in a whorl. (Alisma, the Greek name.)

1. **A. plantago** L. WATER PLANTAIN. Rootstock perennial, becoming almost bulbous by the sheathing bases of the petioles; leaves radical, the blades elliptic-oblong, acute, 2 in. long, varying to 8 in. long and 3 in. broad and tapering from the middle to each end, on petioles twice as long; flowering stems $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, the whorled branches unequal in length and forming a loose, pyramidal panicle; flowers white, on pedicels 1 in. long or less; petals 1 line long; achenes very strongly flattened, oblong, 1 line long, 17 to 25 in the whorl.

Common along the margins of ponds, rivers, and marshy shores of lakes: San Francisco; Alameda; Stockton; lower Sacramento; Napa Valley. The aquatic forms have very narrow leaves.

2. **SAGITTARIA** L. ARROW-HEAD.

Marsh or aquatic herbs with fibrous roots and milky juice. Leaves broadly sheathing, commonly sagittate or sometimes without basal lobes or even without a blade. Flowers pedicelled, borne in whorls of 3 on the upper part of the stem, with membranous bracts. Flowers in ours monoecious, the staminate above. Stamens inserted above the receptacle. Ovaries numerous, crowded on a globose receptacle. Achenes flat, more or less winged and beaked by the short style. (Latin sagitta, an arrow, referring to the shape of the leaves.)

Pedicels of pistillate flowers slender, ascending; leaves sagittate.

Basal lobes much shorter than the upper one or equalling it; racemes with few to several whorls 1. *S. latifolia*.

Basal lobes less than twice as long as the upper one; racemes with numerous whorls..... 2. *S. greggii*.

Pedicels of pistillate flowers much thickened and reflexed in fruit; leaves not lobed at base; racemes with few whorls 3. *S. sanfordii*.

1. ***S. latifolia*** Willd. TULE POTATO. Leaves very variable, 2 to 16 in. in total length; basal lobes lanceolate to broadly ovate, acuminate, divaricate; scape simple or branched, $\frac{1}{4}$ to 3 ft. high; bracts scarious, $2\frac{1}{2}$ to 5 lines long, the pedicels of the pistillate flowers very much longer; flowers monoecious; achene $1\frac{1}{2}$ lines long with somewhat swollen dorsal wing and long horizontally oblique beak.

Common on the islands and river shores of the interior. The tubers of this species are edible and are made much use of by the Chinese of the lower Sacramento.

2. ***S. greggii*** J. G. Smith. STOCKTON ARROW-HEAD. Stout, erect; leaf-blades 8 to 18 in. long, the widely divergent lanceolate basal lobes longer than the ovate and acuminate or lanceolate upper lobe; scape erect, 5-angled below, branching at its summit into several ascending, for the most part long racemes, with numerous whorls of flowers; bracts lanceolate, acuminate, 7 to 14 lines long, equaling or rather shorter than the pedicels; achenes 1 to $1\frac{1}{2}$ lines long, tumid, crested on both margins, circular or the ventral margin almost straight, nearly beakless.

Stockton, original and only known locality in California.

3. ***S. sanfordii*** Greene. SANFORD ARROW-HEAD. Leaves 2 to 3 ft. long; petioles obtusely triquetrous, $\frac{1}{2}$ to $1\frac{1}{2}$ in. thick at the base; blades linear-oblong-lanceolate, about 4 in. long, tapering into the spongy petiole, or almost obsolete in submersed plants; scapes stout, $1\frac{1}{2}$ ft. high or more; bracts triangular, $2\frac{1}{2}$ to 3 lines long, connate at base; whorls of flowers few, the pedicels of the pistillate ones reflexed in fruit; sepals ovate, 2 to 3 lines long; anther longer than the filament; achenes 1 line long, rather markedly winged on both the inner and outer margins, the sides reticulated; beak oblique, short, triangular.

Lower San Joaquin. About 100 acres of pure growth occurs just below the San Joaquin Bridge near Banta; on account of the tubers this area is fed out with hogs (J. A. Sanford). The sepals of the pistillate flower in this and both preceding species are reflexed or spreading. *S. montevidensis* C. & S. is (acc. to J. G. Smith) a ballast plant at Stockton; it may be known by the erect accrescent fertile sepals and by a brownish purple spot at the base of the petals.

3. **LOPHOTOCARPUS** T. Durand.

Closely allied to *Sagittaria*. Fertile flowers with stamens. Sepals erect and appressed in fruit. Stamens hypogynous. (Greek lophos, crest, and karpus, fruit.)

1. *L. californicus* J. G. Smith. Type locality, Stockton, *J. A. Sanford*.

GRAMINEAE. GRASS FAMILY.

By J. BUETT DAVY.

Ours annual or perennial herbs. Nodes solid, sometimes branching, the lower often emitting secondary roots; internodes usually hollow at maturity (pithy in most *Andropogoneae*, some *Paniceae*, etc.) the lowest sometimes shortened and corm-like. Leaves alternate, mostly sessile, the lower portion (sheath) clasping the stem like a tube. Sheath lined by a membrane which is usually prolonged beyond the point of union of sheath with blade as an erect, usually hyaline projection (the ligule), sometimes reduced to a ring of hairs or rarely obsolete. Blades narrow, mostly linear; veins parallel, sometimes in aquatic species united by cross veinlets. Flowers collected into diminutive, spiciform, 1 to many-flowered clusters called spikelets, which are usually subtended by a pair (rarely one or both obsolete) of membranous, chartaceous, coriaceous or cartilaginous bracts. Spikelets arranged in spikes, racemes or panicles. Flowers perfect, monoecious, polygamous, or rarely dioecious; when monoecious the staminate and pistillate flowers may be in the same spikelet (sometimes in *Arrhenatherum*), in separate spikelets, or in separate inflorescences as in Maize (*Zea*); when polygamous, the staminate flowers may be either in the same spikelet, as in *Holcus*, etc., or more rarely in separate spikelets as in many of the *Andropogoneae*. Flowers distichously arranged on the axis (the rachilla) of the spikelet, each subtended by a pair of modified leaves (rarely 1 being obsolete); the lower of these (the bractlet) often similar in texture to the bracts of the spikelet; the upper (the palea) usually thinner, hyaline, with usually 2 nerves, mostly 2-keeled, the inflexed margins enwrapping the flower. Within and at the base of the bractlet are 2 (rarely 1, 3 or more), usually minute organs (the scales); the scales at the time of anthesis become turgid, pushing the bractlets and palea apart, thereby allowing the anthers and stigmas to protrude; after anthesis they lose their turgescence, becoming hyaline, and allow the bractlet and palea to close again. Perianth obsolete, unless represented by the scales. Stamens usually 3, rarely 1, 2, 6 or more, hypogynous; filaments capillary; anthers 2-celled, mostly versatile and pendulous at maturity, usually proterandrous. Ovary superior, 1-celled, 1-ovuled. Styles usually 2, free, or more or less united below, or obsolete; stigmas 2, widely branched and usually plumose, covering a large area and thus specially arranged to catch pollen carried by the wind, usually spirally branched, rarely barbellate with papillate cells. Fruit in ours an achene, often adnate to the palea and sometimes also to the bractlet. Seed in ours adnate to the pericarp. Embryo small, outside the base of the endosperm.

KEY TO THE TRIBES

A. Spikelets 1-flowered, the flower perfect; or with 1 perfect flower and 1 (rarely 2) empty bractlets or staminate flowers below (rarely above) it. Dioecious species and species with 2 or more perfect flowers should be looked for under B.

Both bractlet and palea cartilaginous, coriaceous or chartaceous (at least distinctly firmer in texture than the bracts) and becoming indurated in fruit.

Rachilla jointed below the bracts so that the spikelets fall from the pedicel entire; spikelets terete, or flattened on the back only, not at all laterally compressed; either strictly 1-flowered or the perfect flower subtended by 1 (never more) empty bractlet or staminate flower; lower bract often herbaceous and usually much the smaller

2. **PANICEAE**, p. 36.

Rachilla jointed above the bracts so that these remain after the flowers fall away; spikelets laterally compressed on both sides; subtended by 2 (rarely only 1) some-

- times minute, empty bractlets or staminate flowers; bracts usually sub-equal.....
 3. PHALARIDEAE, p. 39.
- Only the bractlet firmer in texture than the bracts and becoming indurated in fruit; palea hyaline.
- Awn terminal, geniculate; bractlet cylindrical-involute:—Stipa in.....
 4. AGROSTIDEAE, p. 43.
- Awn dorsal, geniculate; bractlet not cylindrical-involute:—sometimes Avena in.....
 5. AVENEAE, p. 51.
- Neither bractlet nor palea firmer in texture than the bracts, though in Hordeae both may be equally firm; often one or both of them hyaline.
- Spikelets pedicellate; arranged in lax or more or less dense and spikelike panicles or racemes; if in racemes or spikes these sometimes densely cylindrical but the spikelets not in distinct rows.
- Spikelets of two kinds in the same inflorescence, one polygamous, the other imperfect or rudimentary; two (one of each kind) or several at a node.
- Spikelets in pairs, or the terminal in threes, at each node of the jointed rachis, one (or two) pedicellate and (in ours) imperfect, the other sessile and containing 1 perfect flower subtended by either a hyaline empty bractlet or a staminate flower1. ANDROPOGONEAE, p. 36.
- Spikelets crowded at each node of a dense, 1-sided, brush-like panicle; the fertile solitary, short, terminating the panicle-branches and entirely concealed by the long sterile spikelets, which consist of about 10 empty bractlets:—Lamarckia in.....7. FESTUCEAE, p. 59.
- Spikelets all of one kind in the same inflorescence, though their contained flowers may be perfect, monoecious or polygamous.
- Perfect flower solitary, without empty bractlets or staminate flowers either above or below it.
- Bractlet with a dorsal awn arising from below the middle or awnless.
- Awn sometimes obsolete, when present straight, not twisted....4. AGROSTIDEAE, p. 43.
- Awn always present, geniculate and twisted:—some forms of Deschampsia and Trisetum in5. AVENEAE, p. 51.
- Bractlet with a terminal awn (sometimes very short):—some species of Koeleria and Festuca in.....7. FESTUCEAE, p. 59.
- Perfect flower with one or two staminate flowers or empty bractlets below (rarely above) it.
- Spikelets with 2 staminate flowers or 2 empty bractlets below the perfect flower —Anthoxanthum and Hierochloa in.....3. PHALARIDEAE, p. 39.
- Spikelets with only one staminate flower (never empty bractlets) below or above the perfect flower:—Arrhenatherum and Holcus in.....5. AVENEAE, p. 51.
- Spikelets with 1 or 2 empty bractlets above the perfect flower:—Melica, Koeleria and Festuca in7. FESTUCEAE, p. 59.
- Spikelets sessile or very short pedicellate; arranged in two close, crowded rows forming 1-sided spikes or racemes; these racemes digitate or fasciculate, rarely solitary; rachis not breaking up at the nodes.....6. CHLORIDEAE, p. 57.
- Spikelets arranged in 2 opposite rows, forming a 2-sided spike or raceme, sessile or very shortly pedicellate on teeth, or in notches or grooves of the rachis which is often flexuous; rachis in many cases jointed at the nodes, each internode at maturity falling away with the attached spikelet.....8. HORDEAE, p. 71.
- B.** Spikelets with two or more perfect flowers (dioecious in Festuceae in the genus Distichlis and sometimes in Poa and Phragmites); imperfect flowers, when present, uppermost (except in Phragmites and rarely in Eragrostis).
- Spikelets pedicellate, arranged in lax or more or less dense and spikelike panicles or racemes; when in racemes or spikes not in opposite rows on the rachis.
- Bracts large in proportion to the whole spikelet, usually enclosing all the flowers; one or more of the bractlets bearing a twisted and abruptly bent awn, usually on the back, rarely from between the teeth of the bifid apex or awnless; when not awned there are 2 nearly opposite flowers, and the rachilla is not prolonged beyond them; in Avena sativa the awn is often obsolete or straight, though the flowers are more than 2 and not opposite.....5. AVENEAE, p. 51.
- Bracts small in proportion to the whole spikelet, usually scarcely exceeding the apex of the first flower; bractlets awnless, or with 1 to 3 straight awns, which are usually terminal, or rarely borne just below the apex....7. FESTUCEAE, p. 59.
- Spikelets arranged in 2 opposite rows, forming a bilateral spike or raceme, sessile or shortly pedicellate on teeth, or in notches or grooves of the rachis which is often flexuous; rachis in many cases jointed at the nodes, each internode at maturity falling away with the attached spikelet.....8. HORDEAE, p. 71.

TRIBE 1. *Andropogoneae*. SORGHUM TRIBE.

Inflorescence a simple or compound panicle, the ultimate branches of which consist of spike-like racemes of few or many spikelets. Rachis usually jointed at the nodes. Spikelets in pairs at each node, or in triplets at the end of each raceme, of two kinds, one of each pair sessile and perfect or polygamous, the other pedicellate and imperfect, rudimentary, or reduced to the pedicel; pedicel and callus often clothed with long silky hairs; spikelets generally with but one flower, usually with a hyaline empty bractlet below it, or rarely the latter bearing a staminate flower in its axil, or obsolete. Lower bract always more indurated than the bractlets, the latter often hyaline and usually one of them bearing a bent or twisted awn; internodes between the different bractlets or flowers not measurable. Palea usually shorter than its bractlet, sometimes obsolete. Stamens usually 3, rarely only 2 or 1.

1. *ANDROPOGON* L. SORGHUM.

Our only species belongs to the sub-genus *Sorghum*, having the stems hard and pithy; racemes solitary or in pairs, panicle; joints of the rachis without a translucent line; bracts broad-lanceolate, finally indurated and shining; awnless (in our species); lower bractlet empty, or sometimes obsolete, much the smaller, hyaline; upper very slender, awnless or with a geniculate awn; palea small, hyaline or obsolete. Scales wedge-shaped. Stamens 3. Styles distinct. (Greek *andro*, man, *pogon*, beard, having reference to the bearded callus of the staminate spikelets in most species.)

1. *A. sorghum* Brot. var. *halepensis* Hackel. JOHNSON-GRASS. Perennial, rootstock stout, creeping; stems stout, erect, 2 to 5 ft. high; leaf-blades flat, with undulate margins, 8 to 24 in. long, $1\frac{1}{2}$ to 3 in. wide, apex drooping; panicle variable $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long, oblong-elliptical, dense or rather loose, more or less drooping; branches mostly in whorls of 4, rarely 2 or 6; sessile spikelets variable, lanceolate or elliptical, 2 to 3 lines long; bracts equal; lower bract of the perfect spikelet firm, more or less shining and often dark colored, obscurely 5 to 9 or 11-nerved; margins involute; upper 3 to 7-nerved; bracts of the staminate spikelets narrow and more acuminate, the lower almost 2-keeled, with 2 prominent nerves near each margin; upper 5-nerved; empty bractlet one-fourth shorter than the lower bract, elliptical-oblong or oval, delicately 2-nerved; lower flower-enclosing bractlet one-half as long as the upper bract, broadly oval, obtuse, 2-lobed, often bearing a short awn; anthers yellow, 1 to $1\frac{1}{2}$ lines long; scales fringed; pedicellate spikelets sometimes reduced to the bractlet, much narrower than the fertile ones.—(*Sorghum halepense* Pers.)

Originally introduced into the United States as a forage plant, now a troublesome weed in orchards and elsewhere. Sparingly naturalized in the San Joaquin Valley. July-Aug. The rootstocks furnish feed for hogs.

TRIBE 2. *Panicaceae*. MILLET TRIBE.

Spikelets arranged in spikes, racemes or panicles, these sometimes digitate or in pairs; rachis usually not jointed at the nodes and therefore not breaking up at maturity; pedicels jointed below the bracts so that these fall away with the rest of the spikelet at maturity. Spikelets terete or flattened on the back only, not at all laterally compressed, all alike, either strictly 1-flowered, or with 1 perfect flower, and a staminate flower, or bractlet and palea, or empty bractlet, below it; lower bract usually much the smaller; perfect flower strictly terminal, its bractlet and palea alike, cartilaginous, coriaceous, char-

taceous, or at least always firmer in texture than the bracts, awnless; lower bractlet sometimes similar in texture to the bracts, sometimes short-awned.

Spikelets without any involucre of bristles or spines.

Bractlet (in ours) apparently 1 only, enclosing a perfect flower; spikelets in 1-sided racemes or spikes which (in ours) are arranged in pairs, or (rarely) in panicles.

2. PASPALUM.

Bractlets 2, the upper subtending a perfect flower, the lower empty or subtending a staminate flower; spikelets sometimes in 1-sided racemes or spikes; these digitate or in panicles 3. PANICUM.

Spikelets subtended by an involucre consisting of from one to many bristles or spines (sterile branches) which are sometimes grown together.

Spikelets deciduous; bristles persistent 4. CHAETOCLOA.

2. PASPALUM L. MILLET-GRASS.

Inflorescence of few digitate, or many panicle, spike-like racemes. Spikelets in 1 to 4 rows upon one side of a flattened, jointless rachis, jointed upon their short pedicels, plano-convex, obtuse or acute, awnless, 1-flowered; bracts apparently 2 or 3 owing to the presence of an empty bractlet which resembles a bract in size and texture and takes its place; lower bract often obsolete, when present minute, 1-nerved, slender, and placed on the flat side of the spikelet; upper much larger, few-nerved. Bractlet (in ours) apparently 1 only, really 2; lower empty, membranaceous, resembling and nearly equaling the upper bract and performing the function of the absent or reduced lower bract, 3-nerved; flower-enclosing bractlet roundish or ovate, coriaceous, rarely mucronate or with a few minute hairs at the apex, large, convex, and partly enclosing the palea. Palea smaller than its bractlet, roundish or ovate, coriaceous, flattish. Scales 2, wedge-shaped or quadrate, emarginate. Stamens 3. Ovary oblong, smooth; styles elongated. Achene enclosed by the indurated bractlet and palea. (The Greek name for Millet-grass.)

1. *P. distichum* L. KNOT-GRASS. Rootstock perennial, widely creeping; stems $\frac{1}{2}$ to 2 ft. high; sheaths somewhat crowded, smooth or hairy, bearded or ciliate at the throat; blades flat, sharp-pointed, linear-lanceolate, $1\frac{1}{2}$ to 6 in. long, 1 to $3\frac{1}{2}$ lines wide, sparingly hairy above, glabrous below, somewhat glaucous; spikes 2 (rarely 3 or 4), 1 to 4 in. long, sub-erect, densely flowered, one sessile, the other shortly pedicellate; rachis $\frac{1}{2}$ to 1 line wide; spikelets $1\frac{1}{2}$ lines long, ovate, acute; those in the middle of a row overlapping about $\frac{1}{4}$ their length; bracts more or less pubescent.

A tropical and sub-tropical species, now naturalized in marshy places throughout the State. Somewhat resembling Bermuda-grass but readily distinguished by its stouter habit and by usually bearing only 2 spikes to each inflorescence; appearance much modified by habitat.

3. PANICUM L. PANIC-GRASS.

Leaves often hirsute or hispid with stiff hairs arising from tubercles between the nerves. Panicle loose and spreading, or close and spike-like; when the spikelets are crowded in pairs on one side of flattened spike-like branches, one spikelet is sessile the other pedicellate. Spikelets without involucre or bristles at the base, 1 or 2-flowered (when 2-flowered the lowest staminate), rarely awned, jointed on the pedicels below the bracts so that these fall away with the flower at maturity; bracts 2 (or 1 only); the lower smaller, often minute or obsolete; the upper equaling the perfect flower. Bractlets 2; the upper enclosing the palea and a perfect flower; the lower resembling the upper bract and empty or bearing a staminate flower or empty palea, the latter when present very thin and hyaline; upper bractlet and its palea alike, coriaceous or cartila-

ginous, usually flattened parallel with the bracts, awnless. Scales 2, fleshy, truncate. Ovary smooth, oblong; styles distinct or very shortly united at the base; stigmas usually purple and longer than the styles. Achene compressed, plano-convex, enclosed by the indurated bractlet and palea. (The Latin name for some cereal, from panis, bread, one species—the Millet, *P. miliaceum*—having been cultivated from prehistoric times as a cereal.)

Spikelets crowded in 2 to 4 rows on 2 sides of triangular, digitate or clustered spikes.

Lower bract minute or obsolete; bractlets awnless, pubescent or nearly smooth.....

1. *P. sanguinale*.

Spikelets imbricate, sessile on 2 sides of a triangular rachis, usually rough with stiff hairs.

Bractlet awned or awn-pointed, mostly shortly hirsute on the nerves.....2. *P. crus-galli*.

Spikelets in lax panicles, pedicellate, awnless.

Annual; spikelets acutely pointed; panicle-branches mostly angular....3. *P. capillare*.

Perennial; spikelets obtuse or barely pointed; panicle-branches filamentous.....

4. *P. dichotomum*.

1. ***P. sanguinale* L. CRAB-GRASS.** Pale green annual; stems usually prostrate and creeping at base, then ascending or erect, 1 to 2 ft. long, usually stout; lower nodes swollen and rooting; sheaths sparingly hairy with long, stiff, white hairs; throat with a tuft of hairs on each side; ligule about 1 line long, broad, truncate, denticulate; blades 2 to 4 in. long, 2 to 3 lines wide, scabrous on both sides; panicle-branches 4 to 6 or more, digitate or clustered, sub-erect, straight, 3 to 5 in. long, 3-sided, spikelet-bearing to the base on 2 sides only; rachis $\frac{1}{2}$ line wide on the flat side, ciliate-scabrous; spikelets in pairs, in 2 to 4 rows, narrowly lanceolate-acuminate, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long, one on a ciliate-scabrous triangular pedicel, the other sessile below it and overlapping; bracts much shorter than the spikelet; lower less than $\frac{1}{4}$ line long, triangular, acute; upper $\frac{3}{4}$ to 1 line long, linear, 3 to 5-nerved, ciliate with long hairs; lower bractlet empty, membranous, 3 to 5 or 7-nerved, ciliate; upper rather shorter, faintly 3-nerved, chartaceous, glabrous, completely enclosing the palea; achene flattened, oblong, 1 line long.

An alien cosmopolitan weed. Sacramento Valley; Stege; Napa Co. July-Sept.

2. ***P. crus-galli* L. BARNYARD-GRASS.** Annual; stems ascending, 1 to 4 ft. high, very stout; lower nodes much swollen, upper constricted; sheaths sparsely hairy; ligule obsolete; blades variable, 6 to 14 in. long, 4 to 6 lines wide, flat, glabrous, or sparsely hairy; margins rough, often wavy, ciliate at the base with long hairs, or glabrous in age; panicle 3 to 6 in. long, green or purple, densely hairy at the nodes; branches somewhat remote, the lowest sometimes 3 in. long, triquetrous, minutely pubescent; pedicels with long, stiff hairs; spikelets crowded on 2 sides of the rachis, $1\frac{1}{2}$ to nearly 2 lines long; lower bract broad, triangular, less than $\frac{1}{2}$ as long as the spikelet, 3-nerved; upper concave, more or less ventricose, broad, oval, 7-nerved, hispid on the nerves, pointed or rigidly awned; lower bractlet empty, shorter than the bracts, 5-nerved, its palea hyaline, 2-nerved; upper bractlet and palea polished, acute or obtuse.

Cosmopolitan weed, naturalized in moist places beside sloughs and streams: Grand Island; Fort Bragg; Soquel Creek; Stege; Stockton. July-Nov.

3. ***P. capillare* L. OLD-WITCH-GRASS.** Annual; stems 1 to 2 ft. high, geniculate below, often branching at base and forming large tufts; sheaths and often the blades hirsute with stiff, spreading hairs; ligule reduced to a ciliate fringe; blades about 6 in. long, $2\frac{1}{2}$ to $5\frac{1}{2}$ lines wide, shortly acuminate, sparsely hairy; edges rough, ciliate below; panicle very diffuse, 6 to 12 in. long, sometimes 9 in. wide; branches solitary or in pairs, sometimes 6 in. long, slender, at first erect, then spreading and finally sometimes deflexed, mostly

angular; spikelets in pairs at the ends of the long branchlets, oblong to oval-acuminate, acutely pointed, one long- the other short-pediceled, the latter overlapping and 1 to $1\frac{1}{2}$ times as long; lower bract 1-nerved, acute; upper 5 to 7-nerved, pointed, about $1\frac{1}{2}$ lines long; empty bractlet $1\frac{1}{4}$ lines long; its palea obsolete; flower-enclosing bractlet obtuse, $\frac{3}{4}$ line long.

Said to occur throughout the State; lower Sacramento; Guerneville. A very variable grass. June-Oct.

4. *P. dichotomum* L. BRANCHED PANIC. Perennial; stems 8 to 24 in. high, at first erect and simple, then decumbent and branching from the prostrate nodes; sheaths with a tuft of soft hairs at the nodes, mostly softly-hairy; lower blades nearly ovate, upper linear-lanceolate, smooth or hairy or velvety, acute, $1\frac{1}{2}$ to 4 in. long, 2 to 3 lines wide; terminal panicle exserted, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, open, ovoid or pyramidal; those of the branches short, often barely exserted; panicle-branches filamentous; spikelets 1 line long, obovate or ellipsoidal, obtuse or barely pointed, smooth or hairy; lower bract $\frac{1}{3}$ as long as the upper, roundish; upper 5 to 7-nerved.

Common in moist sandy soils along the coast and in moist places in the interior. Geysers; Pt. Reyes. June-July.

4. *CHAETOCHLOA* Scribn. BRISTLE-GRASS.

Annuals. Leaf-blades flat. Panicle spike-like, dense, cylindrical, sometimes interrupted below. Spikelets as in Panicum, but always awnless, the short peduncles produced beyond them into one to several awn-like bristles which are at one side of the spikelet, not forming a complete involucre. (Greek chaite, bristle, and chloe, grass, referring to the tuft of long bristles at the base of the spikelet. A genus easily recognized by the dense spike-like panicle, usually bristling with numerous setae; these issue from the pedicels just below the spikelets in the form of an involucre, and are not epidermal, like true hairs, but appear to be abortive panicle-branches.)

1. *C. glauca* (L.) Scribn. BRISTLY FOXTAIL. Stems erect, branching below, 1 to 2 ft. high, leafy; mouth of the sheath clothed with long, silky hairs; blades 4 to 12 in. long, 3 to 5 lines broad, scabrid or scabrous, sometimes sparsely ciliate; panicles $1\frac{1}{2}$ to $2\frac{1}{2}$ or 4 in. long, usually on a long, slender, naked peduncle, though sometimes at first partially enclosed by the uppermost sheath; bristles pale green or tawny yellow; spikelets oval, about 1 line long and a little less broad, obtuse or sub-acute, pale green.—(*Setaria glauca* Beauv.)

Introduced weed; occurring at Fresno. June-Oct.

TRIBE 3. Phalarideae. CANARY-GRASS TRIBE.

Spikelets arranged in panicles, all alike, with 1 perfect flower which is terminal, and 1 or 2 empty bractlets or staminate flowers below it. Empty bractlets occasionally very small or rudimentary. Bractlet and palea of the perfect flower alike, usually becoming indurated, laterally compressed, awnless, nerveless or with only 1 nerve.

Perfect flower subtended by 1 or 2 empty bractlets which are often minute or rudimentary.

Empty bractlets minute, entire, awnless or with minute bristles at the apex. .5. PHALARIS.

Empty bractlets equaling or exceeding the flower-enclosing bractlet, bifid and awned on the back6. ANTHOXANTHUM.

Perfect flower subtended by 1 or 2 staminate flowers.....7. HIEROCHLOE.

5. PHALARIS L. CANARY-GRASS.

Blades flat. Inflorescence a dense, spike-like, rarely interrupted, thyrs. Spikelets crowded, 1-flowered. Bracts about equal in length, boat-shaped, com-

plicate, strongly compressed laterally, usually winged-keeled, 3-nerved. Bractlet and palea of perfect flower subtended by 2 or only 1, small or rudimentary, more or less hairy, empty bractlets. Flower-enclosing bractlet and palea alike, shorter than the bracts, complicate, becoming indurated in fruit; palea a little the smaller. Scales 2 and minute, or obsolete. Stamens 3. Ovary smooth. (Greek phalaros, having a patch of white, from the broad, light-colored margins and patches between the nerves of the bracts in some species. Supposed to be the *Phalaris* of Dioscorides.)

Spikelets all perfect; bracts decidedly winged-keeled on the back; annuals.

Rudimentary bractlets 2; thyrses ovoid.

Spikelets broad; nerves of bracts dark green, mid-nerve curved inwards above; wings broad, white.....1. *P. canariensis*.

Spikelets narrow; nerves of bracts pale green, mid-nerve straight from a little above the base; wings narrow, pale green.....2. *P. caroliniana*.

Rudimentary bractlet 1 only; thyrses from ovoid-oblong to oblong-cylindrical.

Spikelets ovate; nerves of bracts dark green, mid-nerve curved inwards from below the middle; wings narrow, white.....3. *P. minor*.

Spikelets of secondary branches of the thyrses imperfect or abortive, giving a gnawed appearance to the lower part of the thyrses; wing of bract terminating in a horn....

4. *P. paradoxa*.

Spikelets all perfect; bracts wingless or only slightly winged, keeled; annuals or perennials.

Annual; $1\frac{1}{2}$ to 3 ft. high; thyrses cylindrical, almost spikelike, mostly $2\frac{1}{2}$ to 4 in. long; bracts keeled; flower-enclosing bractlet abruptly acuminate.....5. *P. lemmonii*.

Perennial; stems 3 to 8 ft. high; inflorescence usually purplish; bracts strongly keeled; flower-enclosing bractlet acuminate.

Thyrses oblong, 1 to 2 in. long, usually dense.....6. *P. amethystina*.

Panicle 3 to 6 or even 9 in. long, usually much interrupted or lobed.....

7. *P. arundinacea*.

1. *P. canariensis* L. CANARY-GRASS. Annual; stems erect, 1 to 3 ft. high, leafy; uppermost sheaths much inflated; ligule 2 to $3\frac{1}{2}$ lines long; blades 6 to 14 in. long, $1\frac{1}{2}$ to 5 lines wide; thyrses 1 to $1\frac{3}{4}$ in. long, $\frac{5}{8}$ to $\frac{3}{4}$ in. wide, ovoid, dense, uninterrupted; spikelets $2\frac{1}{2}$ to $3\frac{3}{4}$ lines long, laterally flattened, obovate, abruptly pointed; bracts subequal, acute, broadly keeled from below the middle; keel nearly $\frac{1}{2}$ line wide, broadly white-margined, the mid-nerve curved inwards above; empty bractlets 2, 1 to $1\frac{1}{2}$ lines long, narrow, smooth; flower-enclosing bractlet 2 to $2\frac{1}{2}$ lines long, pubescent when young, glabrous in age.

Native of Europe, reported as occurring sparingly near settlements in several localities within our limits. Apr. The well-known "Canary-grass," yielding a favorite bird-seed, much cultivated in the south of Europe.

2. *P. caroliniana* Walt. SOUTHERN CANARY-GRASS. Annual; stems slender, erect, 1 to 2 ft. high; uppermost sheaths somewhat inflated; ligule $1\frac{1}{2}$ to 2 lines long, decurrent, obtuse or truncate, broad, completely enveloping the stem and folded over itself; blades $1\frac{1}{2}$ to $4\frac{1}{2}$ in. long, $2\frac{1}{2}$ to $4\frac{1}{2}$ lines wide, acute, smooth; thyrses 1 to 2 in. long, ovoid; spikelets $2\frac{1}{2}$ to 3 lines long; bracts acute, the mid-nerve straight from a little above the base, nerves and keel concolorous, pale green; empty bractlets about 1 line long, pubescent; flower-enclosing bractlet acuminate, pubescent.

Native of the southeastern States, and apparently not indigenous with us. Oakland; Vacaville. Apr.-May. Much less common than is generally supposed, *P. minor* being often mistaken for it, both in the field and in herbaria.

3. *P. minor* Retz. SMALL CANARY-GRASS. An erect, glabrous, leafy annual, from $7\frac{1}{2}$ in. to 3 ft. high according to locality and season, branched sometimes from every node except the uppermost; upper sheaths sometimes glaucous, much dilated, with a broad, scarious margin; ligule large, 1 to 3 or even $4\frac{1}{2}$

lines long, entire, obtuse; blades $4\frac{1}{2}$ to 13 in. long, $4\frac{1}{2}$ to $7\frac{1}{2}$ lines wide; in small specimens only 2 to 3 in. long, and 3 lines wide; thyrses very dense and compact, from ovoid-oblong and 1 in. long, to oblong-cylindrical and $2\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. wide; spikelets 2 to 3 lines long and 1 line or more wide, lanceolate-acuminate, with a narrow, thin keel above the middle, sometimes irregularly notched; keel and veins ciliate-scabrid; empty bractlet reduced to a single, short, arcuate-subulate bristle with a distinct callus at the base, about $\frac{1}{2}$ line long, closely appressed to the back of the upper flower-enclosing bractlet; the latter $1\frac{1}{2}$ lines long, acute, faintly 5-nerved, more or less pubescent and ciliate above with silky hairs, pale brown, polished and shining where free from hairs; anthers pale- or greenish-yellow.

Indigenous to the Mediterranean Region; now naturalized in the Coast Ranges and Great Valley.

4. **P. paradoxa** L. GNAWED CANARY-GRASS. Stems erect, from a geniculate base, $\frac{2}{3}$ to $2\frac{1}{3}$ ft. high, often branched from the lower nodes; sheaths usually inflated; ligule $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, obtuse and soon lacerate; blades 3 to $7\frac{1}{2}$ in. long, $1\frac{1}{2}$ to 2 lines wide, flat, scabrous on both surfaces, glaucescent; panicle oblanceolate, obtuse, appearing as though gnawed below; usually only the primary branches bearing perfect spikelets, those of the secondary branches being abortive or imperfect; the pedicels of the spikelets in the lower one-third or one-half of the thyrses are much reduced and their spikelets peculiarly aborted; perfect spikelets of lower part of thyrses about $2\frac{1}{2}$ lines long, their bracts acuminate but not awned; those of the upper part about 1 line longer and awn-pointed; keel of bracts narrow, terminating in a long or short horn at $\frac{2}{3}$ from the base; staminate and neuter spikelets 2 to $2\frac{1}{2}$ lines long, the keel running almost to the apex and shortly or barely horned; empty bractlets 2, minute, about $\frac{1}{4}$ line long, appressed to the flower-enclosing bractlet like horny calluses, each with 2 slender cilia-like hairs about their own length at or near the apex; flower-enclosing bractlet about $1\frac{3}{4}$ lines long, obtuse, firm, subglabrous and shining; achene brown, with a black apex.

Native of the Mediterranean Region, naturalized in the Coast Ranges and Great Valley.

5. **P. lemmoni** Vasey. LEMMON'S CANARY-GRASS. Annual; stems slender, erect, $1\frac{1}{2}$ to 3 ft. high; sheaths scarcely inflated; ligule conspicuous, 2 to 3 lines long, decurrent; blades 1 to $7\frac{1}{2}$ in. long, 1 to 4 lines wide, long-acuminate; thyrses 1 to $4\frac{1}{4}$ in. long, nearly cylindrical, sometimes slightly interrupted below; spikelets spreading, 2 to $2\frac{1}{2}$ lines long; bracts sub-equal, scabrid-keeled, not at all, or only minutely winged, narrow and acuminate; empty bractlets 2, about $\frac{1}{2}$ line long, very narrow, shortly hairy below; flower-enclosing bractlet $1\frac{1}{2}$ to 2 lines long, abruptly acuminate, pubescent.

Apparently restricted to California: Santa Cruz Mts. and southward, very rare.

6. **P. amethystina** Trin. PURPLE CANARY-GRASS. Perennial; stems stout, erect, usually 4 to 8 ft. high, often growing in large clumps; ligule 2 to $3\frac{1}{2}$ lines long, obtuse; blades $2\frac{1}{2}$ to $8\frac{1}{2}$ in. long, 4 to 6 lines wide; margins scabrid; peduncle long, slender; thyrses $1\frac{1}{4}$ to $3\frac{3}{4}$ in. long, about $\frac{3}{4}$ in. broad, ovate or ovoid, usually purplish; spikelets 3 to $3\frac{1}{2}$ lines long; bracts strongly keeled but not winged, acute, glabrous except for the scabrid keel; empty bractlets $1\frac{1}{2}$ to $1\frac{3}{4}$ lines long, hirsute except on the nerve, which is shining; flower-enclosing bractlet 2 to $2\frac{1}{2}$ lines long, acuminate, shining, sparsely hairy.

Moist places in the Coast Ranges from Mendocino Co. southward. Apr.-Oct.

7. **P. arundinacea** L. REED CANARY-GRASS. Perennial; rootstock creeping; stems stout, erect, usually 3 to 6 ft. high; sheaths scarcely inflated; ligule broad, clasping the stem, 2 to 6 lines long, blades 4 to 12 in. long, 3 to 7 lines wide, scabrous on the margins, otherwise smooth; panicle 3 to 6 or 9 in. long, often purplish, and much interrupted or lobed; branches few at a node, the lower $\frac{1}{2}$ to 2 in. long; bracts linear-lanceolate, strongly keeled, scabrid; empty bractlets 2, narrow, hairy, about $\frac{1}{2}$ the length of the flower-enclosing bractlet; the latter about $1\frac{1}{2}$ lines long, acuminate, sub-glabrous and shining.

Moist places beside streams and sloughs: Niles; Upper Lake; Bakersfield. Beal states that it is often called "Crazy-grass" in the Northwest, as it is thought to be injurious to horses.

6. **ANTHOXANTHUM** L. SWEET VERNAL-GRASS.

Leaf-blades flat. Panicle cylindrical, spikelike. Spikelets 1-flowered; bracts thin, herbaceous, persistent, keeled, lower 1-nerved, upper about twice its length and 3-nerved; flower perfect, terminal, subtended by 2 empty dorsally awned bractlets which are clothed with brown hairs and are smaller than the bracts; rachilla jointed above the bracts. Flower-enclosing bractlet and palea alike, awnless, smooth, obtuse, at first hyaline, then chartaceous; bractlet enveloping the palea, with 3 very fine nerves; palea narrower, with 1 very fine central nerve or keel. Scales obsolete. Stamens 2; anthers large, yellow. Ovary glabrous; styles long, distinct; stigmas long. (Greek anthos, a flower, xanthos, yellow, in allusion to the yellow tint given to the spikelets by the brightly colored anthers. Becoming fragrant in drying.)

1. **A. odoratum** L. SWEET VERNAL-GRASS. Perennial; stems $\frac{1}{2}$ to 2 ft. high, shining; sheaths furrowed, glabrous or pubescent, hairy at the mouth; blades often sparingly hairy, $1\frac{1}{2}$ to 6 in. long; panicle 1 to $1\frac{1}{2}$ (rarely 5) in. long, contracted, sometimes interrupted below; branches very short; spikelets 3 to 4 lines long, sub-sessile, often yellowish-green; lower bract ovate, acute, about 2 lines long, hyaline; upper lanceolate, awn-pointed, about $4\frac{1}{2}$ lines long; empty bractlets curved, emarginate or shortly bifid, $1\frac{1}{2}$ lines long; awn short; stigmas long-exserted.

Introduced at Mendocino City and Crescent City, and reported by Dr. Behr as occurring in Marin Co. May-July. Its fragrance is attributed to the presence of cumarin.

7. **HIEROCHLOE** Gmel. VANILLA-GRASS.

Sweet-scented perennials, with flat, often broad, acuminate leaf-blades. Panicle loose, pyramidal. Spikelets somewhat laterally compressed, often shining and scabrid, with 1 terminal, perfect flower, subtended by (in ours) 2 staminate ones; bracts about equal, obscurely 1 to 3-nerved, keeled, acute, glabrous. Staminate flowers sessile; bractlet and palea alike, villous, scarcely shorter than the bracts, obtuse, emarginate or bifid, keeled, the main nerve often extending into a short awn; bractlet 5-nerved; palea 2-nerved; stamens 3. Perfect flower shortly pedicellate; bractlet becoming indurated above, awnless, 5-nerved; palea narrow, 3-nerved or nerveless beyond the keel; stamens often 2 only. Scales 2, lanceolate. Ovary smooth. (Greek hieros, sacred, chloe, a grass, one species in north Europe used for strewing church floors.)

1. **H. macrophylla** Thurb. LARGE-LEAVED VANILLA-GRASS. Rootstocks in bunches (sometimes very large), stoloniferous; stems 1 to 2 ft. high, erect,

leafy; panicle narrow, 3 to 6 in. long, lax and open; branches 1 or 2 at a joint, bearing few, large spikelets with spreading bracts; spikelets about 2 lines long, 2 to 3 lines wide when open, brownish, brightly shining; anthers yellow, about 1 line long.—(*Savastana macrophylla* Beal.)

In light loose soil on moist shaded banks of coniferous forests in the Redwood belt, from Marin Co. northward. Mar.-May. Said to owe its fragrance to the presence of cumarin; it has been known to retain some of its odor for fully thirty years after gathering.

TRIBE 4. Agrostideae. BENT-GRASS TRIBE.

Inflorescence paniculate or rarely racemose, often cylindrical, dense and spike-like. Spikelets all fertile, strictly 1-flowered. Flower always perfect, either terminal, or sometimes the rachilla prolonged beyond its insertion, as a bristle. Rachilla jointed above the bracts (except in *Alopecurus* and *Polypogon*) so that these persist after the flower falls. Bracts usually equaling or exceeding the bractlet. Palea 2-nerved or nerveless, in some species of *Agrostis* and *Alopecurus* minute or obsolete.

Bractlet indurated at maturity (at least firmer in texture than the bracts) and very closely enveloping the fruit; panicle (in ours) lax; awn persistent, twisted, stout.8. *STIPA*.

Bractlet usually hyaline or membranous at maturity (at least not noticeably firmer in texture than the bracts); panicle various, but usually contracted, dense and spike-like.

Pedicle jointed below the bracts, so that these fall away with the flower at maturity, sometimes together with the whole or a part of the pedicel.

Bracts awnless.10. *ALOPECURUS*.

Bracts long-awned.11. *POLYPOGON*.

Pedicle not jointed below the bracts; rachilla jointed above the bracts so that these persist after the flower has fallen.

Spikelets 3 lines or less long.

Rachilla naked or with a few very short hairs.

Bracts strongly keeled, complicate, abruptly acute, ciliate fringed on the keels.9. *PHLEUM*.

Bracts obscurely keeled above, saccate below, acuminate, $\frac{3}{4}$ longer than the bractlet13. *GASTRIDIVM*.

Bracts neither prominently keeled nor saccate, acute or acuminate; very small.12. *AGROSTIS*.

Rachilla with a tuft of long hairs on the callus, about $\frac{1}{2}$ the length of the bractlet.14. *CALAMAGROSTIS*.

Spikelets 5 to 6 lines long; bractlet and palea chartaceous; a tall sand-dune grass.15. *AMMOPHILA*.

8. *STIPA* L.

Rootstock tufted. Leaf-blades narrow, involute or convolute. Panicle lax, mostly open or somewhat contracted. Spikelets 1-flowered. Bracts subequal, keeled, often terminated by a long subulate point, persistent; rachilla jointed above the bracts. Bractlet and palea dissimilar; bractlet firm, narrow, rolled around the flower, with a terminal, undivided, bent, persistent awn, spirally twisted below the bend; palea usually shorter, thinner, 2-nerved. Scales usually 3 and large. Stamens usually 3, rarely only 1 or 2; anthers often tipped with a tuft of short hairs. Ovary stipitate, smooth; styles 2, short; stigmas plumose with simple hairs. (Greek *stipe*, feathery, referring to the long, feathery awns of some species. Ours usually met with on dry hillsides. One of the several genera known as "Bunch-grasses.")

Awn $2\frac{1}{2}$ to 4 in. long.1. *S. setigera*.

Awn less than 2 in. long.2. *S. eminens*.

Panicle open, branches spreading; anthers tipped with a tuft of short hairs.3. *S. viridula*.

Panicle strict, narrow; branches short, erect; anthers naked.3. *S. viridula*.

1. *S. setigera* Presl. BEAR-GRASS. Perennial; stems erect, 1 to 3 ft. high; panicle 5 to 12 in. long, open, nodding in flower; branches in pairs, slender, bearing a few drooping spikelets; bracts 6 to 10 lines long, long-acuminate; bractlet 3 lines long, silky-hairy sometimes all around below, but only on the nerves above, minutely tuberculate; awn stoutish, $2\frac{1}{2}$ to 4 in. long, hairy below.

Common on dry hillsides from Mendocino Co. southward: Berkeley Hills; San Francisco. Mar.-June.

2. *S. eminens* Cav. var. *andersoni* Vasey. ANDERSON'S STIPA. Perennial; stems erect, 1 to 3 ft. high, slender; panicle 2 to 5 in. long, open, nodding in flower; branches in pairs, very short, slender, spreading, bearing few drooping spikelets; bracts 3 to 4 lines long, acuminate; bractlet about 3 lines long, silky-hairy all over; awn slender, about 1 in. long, scabrid but not hairy; anthers tipped with a tuft of short hairs.

Dry Coast Range foothills: Oakland Hills; Berkeley; St. Helena. Apr.-June. Frequently occurring in company with *S. setigera* and sometimes confused with it, but at once distinguishable by the shorter bracts and awn. The home of the typical *S. eminens* Cav. is Ecuador, and it is said to occur also in southern California and Arizona.

3. *S. viridula* Trin. FEATHER BUNCH-GRASS. A perennial with dense, narrow panicle and short, erect branches, and with naked anthers, is found in the northern Coast Ranges and the middle Sierra Nevada; reported from the vicinity of San Francisco by Dr. Behr.

9. PHLEUM L. TIMOTHY.

Ours perennial. Leaf-blades flat. Inflorescence a dense, cylindrical or ovoid thyrses or false spike, often pubescent, borne on a long peduncle. Spikelets crowded, 3 lines or less long, much compressed laterally, 1-flowered. Rachilla very short, jointed above the bracts and sometimes extending beyond the insertion of the bractlet as a short spine. Bracts distinct, complicate, boat-shaped, almost equal, membranous, 1 to 3-nerved, abruptly acute, persistent, compressed-keeled, the keel projecting into an abrupt mucro or very short awn. Bractlet shorter than the bracts, awnless, very thin, truncate or denticulate. Palea narrow, hyaline, 2-nerved, sometimes bearing a minute bristle on the back from near the base. Scales 2, hyaline, toothed above. Stamens 3. Ovary smooth; styles long; stigmas slender. (Phleos, the ancient Greek name for some marsh or water-plant.)

Panicle $1\frac{1}{2}$ to $9\frac{1}{2}$ in. long, rough to the touch, not feathery; spikelets about $1\frac{1}{2}$ lines long including the awn.....1. *P. pratense*.

Panicle $\frac{1}{2}$ to $1\frac{1}{2}$ (rarely 2) in. long, soft to the touch; spikelets 2 to $2\frac{1}{2}$ lines long including the awn.....2. *P. alpinum*.

1. *P. pratense* L. TIMOTHY. Rootstock tufted, stoloniferous; stems solitary or tufted, erect, leafy, 1 to 4 ft. high, simple, bright green; lower internodes often swollen and corm-like; sheaths glaucescent, striate, glabrous; ligule brownish, $1\frac{1}{2}$ to 2 lines long, abruptly acute; blades $2\frac{1}{2}$ to 3 lines wide, minutely scabrid, especially on the edges, glaucescent; panicle $1\frac{1}{2}$ to 9 in. long, about 3 lines wide, rough to the touch, not feathery; spikelets about $1\frac{1}{2}$ lines long including the awns, rigid, pale green or purplish; bracts about 1 line long, hyaline except the nerves; nerves 3, converging above into a divergent, scabrous mucro about $\frac{1}{2}$ line long, the central nerve pectinate-ciliate; margins of the bract abruptly truncate below the mucro; bractlet about 1 line long, broad, completely enfolding the narrow palea, faintly 5 to 7-nerved and toothed; palea faintly 2-nerved, emarginate; anthers about 1 line long and yellow before shedding the pollen, afterwards shrunken and lavender-colored.

Naturalized forage-grass: Glen Ellen; Russian River near Guerneville. June-Aug.

2. **P. alpinum** L. MOUNTAIN TIMOTHY. Closely related to *P. pratense* but stems rarely more than a foot high, usually stouter and more leafy, slightly decumbent at base; internodes not corm-like; uppermost sheaths inflated; ligule about 1 line long, truncate; leaf blades short, acute, $1\frac{1}{2}$ to 5 lines wide; panicle ovoid or oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, feathery, usually darker in color; spikelets 2 to $2\frac{1}{2}$ lines long including the awns; margins of bracts less abruptly truncate; anthers about $\frac{3}{4}$ line long.

Sierra Nevada and the higher Coast Ranges; also on dry sandy bluffs along the coast from Crescent City to San Francisco. Apr.-Aug.

10. **ALOPECURUS** L. FOX-TAIL.

Aspect much that of *Phleum*. Upper sheaths usually inflated; leaf blades flat. Inflorescence a dense, cylindrical or ovoid, terminal thyrses or false spike, which is soft to the touch and jointed on the apex of the enlarged peduncle. Spikelets 1-flowered, crowded, 3 lines or less long, much compressed laterally. Bracts somewhat united at the base, conduplicate, compressed-keeled, deciduous with the flower; keel ciliate-fringed or slightly winged. Rachilla not jointed above the bracts. Flower decidedly protogynous. Bractlet and palea hyaline, equaling or barely shorter than the bracts; bractlet broad, obtuse, 1 to 3 or 5-nerved, with a short, very slender, bent awn on the back, at, or below, the middle; margins connate at the base, enclosing the flower; palea usually obsolete, when present narrow, acute, keeled, partly included by the bractlet. Scales obsolete. Stamens 3. Ovary smooth; stigmas long, shortly hairy with simple hairs. (Greek *alopez*, a fox, *oura*, a tail, from the fancied resemblance of the thyrses to a fox's tail. Closely resembling and nearly allied to *Phleum*. The name "Fox-Tail" has frequently been applied, in California, to the Barley-grasses, species of the genus *Hordeum*.)

Spikelets $2\frac{1}{2}$ to 3 lines long; thyrses $2\frac{1}{2}$ to $3\frac{1}{4}$ in. long.....1. *A. pratensis*.

Spikelets $1\frac{1}{2}$ to 2 lines long; thyrses 1 to 2 in. long, $2\frac{1}{2}$ to $4\frac{1}{2}$ lines wide.....2. *A. californicus*.

Spikelets 1 to $1\frac{1}{2}$ lines long; thyrses $\frac{3}{4}$ to 1 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide.....3. *A. geniculatus*.

1. **A. pratensis** L. MEADOW FOX-TAIL. Rootstock perennial, stoloniferous: stems erect or the lowest node geniculate, smooth; sheaths smooth, upper much inflated; ligule $\frac{1}{2}$ to $1\frac{1}{2}$ lines long, entire, truncate, brown, scabrid; blades $1\frac{1}{2}$ to 3 lines wide; panicle slender, dense, cylindrical, obtuse, $2\frac{1}{2}$ to $3\frac{1}{4}$ in. long, soft, pale green or purplish; branches very short, with 3 to 6 spikelets; spikelets $2\frac{1}{2}$ to 3 lines long, 1 line wide, narrowly oval, much compressed, acute; bracts acute, villously ciliate on the keel; margins connate for about $\frac{1}{4}$ to $\frac{1}{2}$ their length; bractlet awned from near the base; margins connate for $\frac{1}{3}$ to $\frac{1}{4}$ their length; awn about 4 lines long, exerted $\frac{1}{2}$ its length.

Naturalized from Europe near settlements but apparently nowhere plentiful. Waverly (J. A. Sanford). Apr.-July.

2. **A. californicus** Vasey. CALIFORNIA FOX-TAIL. Perennial, allied to *A. pratensis*, but the thyrses only 1 to 2 in. long; spikelets $1\frac{1}{2}$ to 2 lines long; bracts obtuse, only slightly united at the base, often ciliate for only $\frac{2}{3}$ their length; awn exerted $1\frac{1}{2}$ to 2 lines, mostly strongly geniculate; anthers bright yellow.

Apparently peculiar to California and Oregon. Wet places: Santa Cruz Co.; Berkeley. May.

3. **A. geniculatus** L. WATER FOX-TAIL. Perennial; stems procumbent and rooting from the lower nodes, then ascending 1 to 1½ ft., smooth; sheaths smooth, upper inflated; ligule 1 to 1½ lines long; blades ½ to 1½ lines wide; panicle slender, dense, cylindrical, obtuse, ¾ to 1 in. long; branches very short, with often only 1 spikelet; spikelets 1 to 1½ lines long, truncate; bracts silky, especially on the keel, obtuse, broadly scarious; bractlet glabrous; margins united ½ way up; awn about 2 lines long, exerted ½ its length; anthers purplish.

Naturalized, wet meadows, ditches, and marshy or springy places: Bear Valley (J. B. Davy). Apr.-Sept. Var. **ARISTULATUS** Torr. Wild Water Fox-tail, is said to differ mainly in being glaucous; sheaths more inflated; blades broader; panicle longer (often 2 in.) and paler, and the bracts still more obtuse; awn very short, barely exerted, inserted near the middle of the bractlet; anthers shorter, yellow, oblong.—In wet places, apparently indigenous. Reported from the Klamath Marshes and Marin Co.

11. **POLYPOGON** Desf. BEARD-GRASS.

Stems solitary or tufted, decumbent at base. Blades flat. Panicle contracted. Spikelets 1-flowered, rarely exceeding a line in length, jointed on the pedicel below the bracts so that these fall away with the flower at maturity. Bracts sub-equal, keeled, bifid or notched, with a terminal straight awn at or below the apex, 1-nerved, deciduous. Bractlet awned or not; palea smaller, 2-nerved. Scales 2, falcate, entire, as long as the ovary. Stamens 3; anthers small. Ovary glabrous; styles short, free; stigmas long, feathery. (Greek *polus*, many, *pogon*, beard, referring to the numerous awns; these give a bristly appearance to the inflorescence.)

Annual; panicle dense, not distinctly lobed or interrupted, except rarely below; awns 2 to 3½ lines long. 1. *P. monspeliensis*.
Perennial; panicle much interrupted or distinctly lobed, almost throughout; awns about 1 line long. 2. *P. littoralis*.

1. **P. monspeliensis** (L.) Desf. TAWNY BEARD-GRASS. Annual; rootstock tufted; stems a few inches to 2 or even 3 ft. high, leafy; panicle dense, not distinctly lobed or interrupted except sometimes below, 1½ to 4 in. long, often of a tawny tinge; spikelets very numerous, nearly hidden under the slender awns; awns 2 to 3½ lines long; bracts scabrous, deeply notched; bractlet truncate-dentate.

Native of Europe. Abundant throughout the State, especially in moist places: Martinez, Berkeley, Oakland, San Francisco, Point Reyes. Apr.-Aug. or Oct.

2. **P. littoralis** Smith. WATER BEARD-GRASS. Perennial; rootstock solitary; stems weak, ascending, geniculate at the lower nodes, 1 to 2 ft. high; panicle much interrupted or distinctly lobed, 2 to 5 or rarely 6 in. long, somewhat shining, often purplish; branches in dense whorls, very irregular; spikelets not concealed by the awns; awns 1½ to 3 lines long; bractlet awned.

Introduced and common in moist localities along the coast: San Francisco, Berkeley, etc. Apr.-Aug. Closely resembling *Agrostis verticillata* but at once distinguished by the presence of awns.

12. **AGROSTIS** L. BENT-GRASS.

Leaf-blades flat. Panicle-branches whorled, often in clusters of several, filiform. Spikelets very numerous, small, 1½ to 2 lines long, strictly 1-flowered. Bracts narrow, not prominently keeled, acute or acuminate, awnless or almost

awn-pointed, persistent; lower somewhat longer than the upper. Rachilla not distinctly prolonged beyond the insertion of the flower, jointed below the bractlet; callus very short, naked, or with a few short hairs. Bractlet mostly shorter than the bracts, very thin, broad, 3 to 5-nerved, obtuse or truncate and toothed, awnless or with a slender, straight, twisted awn on the back usually much below the apex. Palea rarely more than $\frac{1}{2}$ the length of the bractlet, often very minute or obsolete. Scales 2, entire, minute. Stamens mostly 3. Styles very short, free; stigmas feathery. (Agrostis, the Greek name for a grass which mules fed on, perhaps derived from agros, a field, having reference to the habitat of some species.)

Palea conspicuous, $\frac{1}{3}$ to $\frac{2}{3}$ the length of its bractlet.

Rootstock stoloniferous; panicle open, 6 to 8 in. long; palea $\frac{1}{4}$ to $\frac{1}{2}$ shorter than its bractlet1. *A. alba*

Rootstock not stoloniferous; panicle interrupted but dense, $1\frac{1}{2}$ to 4 in. long; palea about equaling its bractlet.....2. *A. verticillata*.

Palea obsolete, or, if present, minute.

Rootstock tufted, not at all stoloniferous; panicle dense and rigidly erect; spikelets 1 line long.

Panicle narrowly oblong, dense, 2 to 4 in. long, 5 to 9 lines wide; bractlet awned; awn about 1 line long.....3. *A. densiflora*.

Panicle linear, 4 to 6 in. long, 3 to 4 lines wide; bractlet awnless....4. *A. asperifolia*.

Rootstock slender and creeping; panicle narrow, not dense and not rigid; spikelets $1\frac{1}{2}$ lines long.

Panicle $2\frac{1}{2}$ to 5 in. long; bractlet awnless.....5. *A. diegoensis*.

1. *A. alba* L. var. *stolonifera* Auct. CREEPING BENT. Perennial, stoloniferous and sometimes forming a dense turf; stems decumbent at base, and rooting at the lower nodes, then erect, 1 to 3 ft. high; sheaths scabrid or almost smooth; ligule $1\frac{1}{2}$ lines long, obtuse; blades 3 to 6 in. long, $1\frac{1}{2}$ lines wide, acute, antrorsely scabrous; panicle open, 6 to 8 in. long, narrow; branches sub-erect in $\frac{1}{2}$ whorls, the longest about 2 in. long, branched and spikelet-bearing to near the base; rachis and pedicels scabrous, the latter distinctly clavate; spikelets about 1 line long; bracts sub-equal, narrow, acute, scabrous on the solitary nerve, widely gaping when dry; callus with a tuft of minute hairs on each side; bractlet awnless, narrow-lanceolate, $\frac{3}{4}$ to 1 line long, minutely 3-toothed; nerves very indistinct; palea distinct, about $\frac{1}{2}$ line long; stamens 3; anthers $\frac{1}{2}$ line long.—(*A. stolonifera* L. ?)

Native of Europe, introduced as a pasture grass and naturalized in several localities, preferring moist situations. Flats along the Russian River near Guerneville. July.

2. *A. verticillata* Vill. WHORLED BENT-GRASS. Perennial; rootstock not stoloniferous; stems ascending from a decumbent base, 1 to 2 ft. high, rooting from the lower nodes; sheaths inflated, striate; ligule 1 to 2 lines long, obtuse, scabrid; blades 2 to 4 in. long, 1 to 3 lines wide, scabrid above; panicle loosely contracted, $1\frac{1}{2}$ to 4 in. long, 4 to 6 lines wide; branches sub-erect, whorled, the longest about 1 in. long and naked at the base, the rest spikelet-bearing from the base up; spikelets 1 line long, obtuse; bracts subequal, obtuse, 1-nerved, scabrid; callus apparently naked; bractlet $\frac{1}{2}$ line long, 5-nerved and prominently 5-toothed, glabrous; palea conspicuous, almost equaling the bractlet, 2-nerved; stamens 3.

Native of S. Europe. Common in wet places beside springs and streams: San Francisco; Stege; Berkeley; Agnews to the upper San Joaquin Valley.

3. *A. densiflora* Vasey. SEA BENT. Apparently annual; stems erect or ascending from a decumbent base, 3 to 12 in. high, stout, leafy; sheaths loose and inflated, smooth or scabrid; ligule 1 to 2 lines long, truncate; blades 2 to 4 in. long, 2 to $3\frac{1}{2}$ lines wide, obtuse, scabrous; panicle narrowly oblong,

dense, lobed, 2 to 4 in. long, 5 to 9 lines wide, rarely interrupted at the base; branches crowded, erect, whorled or the lowest in $\frac{1}{2}$ whorls, all but the longest densely crowded with spikelets from the base up; longest $\frac{1}{2}$ to 1 in. long; spikelets $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; bracts sub-equal, narrow, acuminate-pointed, 1-nerved, scabrous especially on the nerve; callus with a tuft of minute hairs at the base of each margin of the bractlet; bractlet 1 line long, glabrous, minutely toothed at the apex, 5-nerved below, midnerve excurrent from a little below the apex as a scabrid awn about 1 line long; palea obsolete or minute; stamens 3.—(*A. mucronata* Thurb. in Bot. Cal.)

Along the coast from Santa Cruz to Fort Bragg. July-Aug.

4. *A. asperifolia* Trin. NORTHERN RED-TOP. Annual; stems tufted, stiffly erect, stout, leafy, 1 to 2 ft. high; sheaths minutely scabrid, margins scabrous; ligule 1 to 2 lines long, truncate or obtuse, more or less decurrent; blades 3 to 6 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide, acuminate or acute, scabrous; panicle shortly exserted, linear, interrupted below, lobed and dense above, 4 to 6 in. long, 3 to 4 lines wide; branches crowded, erect, densely whorled and some at each node densely spikelet-bearing from the base, the longest $\frac{3}{4}$ to $1\frac{1}{2}$ in. long and naked below; spikelets $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; bracts subequal, narrow, acuminate 1-nerved, scabrous only on the nerve; callus with a tuft of minute hairs at the base of each margin of the bractlet, or apparently naked; bractlet $\frac{3}{4}$ line long, glabrous, minutely toothed at the apex, faintly nerved, awnless; palea obsolete or minute; stamens 3.—(*A. exarata* Thurb. in Bot. Cal., in part.)

Common in the San Francisco Bay Region in salt-marshes and other wet places: Berkeley; Lake Pilarcitos; San Francisco; Martinez. June. Apparently near to *A. densiflora*, but at once distinguished from it by the taller stem, longer and narrower leaves and panicle, and the absence of awns.

5. *A. diegoensis* Vasey. SAN DIEGO BENT-GRASS. Rootstock perennial, slender, stoloniferous; stems slender, erect, 2 to $2\frac{1}{2}$ ft. high; sheaths minutely scabrid; ligule 2 to 4 lines long, acuminate, more or less lacerate, decurrent; blades $2\frac{1}{2}$ to 7 in. long, $\frac{1}{2}$ to 1 line wide, antrorsely scabrous especially on the margins; panicle narrow, lax, well exserted, 2 to 5 in. long; branches erect, the longest 1 to 3 in. long, all but the longest spikelet-bearing to near the base; spikelets $1\frac{1}{2}$ lines long; bracts acute, sub-equal, scabrid; callus with a prominent tuft of hairs about $\frac{1}{2}$ line long, at the base of each margin of the bractlet; bractlet awnless or short-awned, 1 to $1\frac{1}{2}$ lines long, scabrid especially on the margins above, 4-toothed, prominently 5-nerved, the mid-nerve not reaching the apex, sometimes excurrent below the middle as a short awn $\frac{3}{4}$ line long or less; palea minute or obsolete; stamens 3; anthers 1 line long, purplish.

Abundant in the shade of bushes on dry hillsides of the Coast Ranges from San Diego to Sonoma Co.: Berkeley Hills; Hood's Peak; Olema; Point Reyes. June-Aug. One of our most abundant native grasses.

13. GASTRIDIMUM Beauv.

Erect annual. Leaf-blades flat. Panicle spike-like, contracted, cylindric-fusiform, shining. Spikelets small, 1-flowered. Bracts much exceeding the bractlet, shining, gibbous at the base, obscurely keeled above, saccate below, acuminate or awn-pointed, the lower much the longer. Rachilla prolonged beyond the insertion of the flower. Bractlet and palea equal, alike, minute, hyaline, shortly stipitate and with a tuft of very minute hairs at the base; bractlet truncate, toothed, with or without a slender, twisted, dorsal awn which equals or

exceeds the bracts; palea narrow. Scales 2, oblong, entire, as long as the ovary. Stamens 3. Stigma sub-sessile. (Greek gastrideon, ventricle, having reference to the ventricose bases of the bracts.)

1. *G. lendigerum* (L.) Gaudin. NIT-GRASS. Stems tufted, erect from a geniculate base, 6 to 24 in. high, branching at the lower nodes; sheaths slightly rough; ligule about 2 lines long, lacerate fringed; blades 2 to 5 in. long, about 2 lines wide, long-pointed, scabrous on both sides, pale green; panicle 3 to 6 in. long, about $\frac{1}{2}$ in. wide, very pale green, shining with a satiny luster, in large specimens somewhat lobed; pedicels clavate; spikelets about 2 to $2\frac{1}{2}$ lines long, very acute; bracts somewhat scabrous above; bractlet hairy, white, shining, 4-toothed; awn from just below the apex, very slender.—(*G. australe* Beauv.)

Native of the Mediterranean Region; naturalized in California, and common near the coast: Petaluma; Briones Hills; Berkeley, and northward and southward. June-Oct. One of the latest grasses to appear.

14. CALAMAGROSTIS Adans. REED BENT-GRASS.

Stems tall, often reed-like. Panicle-branches whorled. Spikelets 1-flowered; rachilla jointed above the bracts, shortly prolonged beyond the insertion of the flower and bearing a tuft of long, white, silky hairs, which in all of ours are much shorter than the bractlet. Bracts enclosing the bractlet, sub-equal, concave, acuminate, awnless; upper 3-nerved. Bractlet hyaline, 3 to 5-nerved, truncate, 2-fid, toothed, in ours awned at the tip or on the back with a twisted, strongly geniculate, conspicuously exerted awn. Palea small, 2-nerved. Scales 2, entire, acute. Stamens 3. Ovary glabrous; styles short, distinct; stigmas feathery. (Greek kalamos, reed, agrostis, a kind of grass, with reference to the reed-like habit of some species.)

In the absence of an adequate series of specimens the following key has been adapted from that prepared by Kearney in his Revision of the N. American species of the genus in Bull. 11 of the U. S. Dep. of Agriculture, Division of Agrostology.

Awn greatly exceeding the bracts.

Strongly caespitose, rather hard in texture; leaf-blades strongly involute; panicle dense, branches appressed.....1. *C. purpurascens*.

Awn shorter than, or not much exceeding the bracts.

Spikelets strongly compressed; bracts sharply keeled; plant tall; leaf-blades not filiform.

Panicle wide, usually loose, not spikelike; leaves often flat.....2. *C. aleutica*.

Panicle narrower and dense, spikelike; leaves all strongly involute.

Panicle strict; spikelets about 3 lines long.....3. *C. angusta*.

Panicle usually somewhat flexuous; spikelets 2 to $2\frac{1}{2}$ lines long; awn arising from near the base of the bractlet.....4. *C. subflexuosa*.

Spikelets not strongly compressed; bracts not strongly keeled; plant caespitose; stems usually somewhat rigid; leaf-blades usually filiform.

Lower leaves in a dense tuft, short, rather rigid, strongly involute; spikelets about $3\frac{1}{2}$ lines long.....5. *C. fasciculata*.

Lower leaves rarely forming a dense tuft, usually elongated, not rigid; panicle narrow, spiciform, usually red-purple.....6. *C. rubescens*.

1. *C. purpurascens* R. Br. PURPLE REED-GRASS. Rootstock perennial, strongly tufted; stems erect, 1 to 2 ft. high, rather hard in texture; ligule about 1 line long, lacerate; blades strongly involute and scabrous; panicle very dense, spikelike, often slightly interrupted below, 3 to 4 in. long, varying from pale to dark purple; branches usually in fives below, appressed, the longest not more than an inch long; spikelets 3 to $3\frac{1}{2}$ lines long; bracts sub-equal, very acute; upper distinctly 3-nerved; callos hairs unequal, the longest, at the

sides, about $\frac{1}{4}$ the length of the bractlet; awn arising from very near the base of the bractlet, exerted more than $\frac{1}{2}$ the length of the bracts.—(*C. sylvatica*, Thurb. in Bot. Cal., not of DeCandolle. Description adapted from that of Thurber, in the absence of specimens. Reported as having been collected by Bolander in the "Redwoods," but the actual locality is not stated; perhaps not within our limits, but to be looked for.)

2. *C. aleutica* Bong. ALEUTIAN REED-GRASS. Stems stout, erect, 2 to 5 ft. high; sheaths minutely scabrid; blades 6 to 12 in. long, 3 to 5 lines wide, scabrid on both surfaces, margins scabrous; panicle 6 to 10 in. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. broad, loosely contracted and somewhat interrupted, somewhat drooping above; branches erect, some at each node spikelet-bearing from the base; spikelets acute; lower bract $1\frac{1}{2}$ to $3\frac{1}{2}$ lines long, glabrous except the scabrid keel; upper rather shorter; bractlet $2\frac{1}{2}$ to 3 lines long; awn from near the middle of the bractlet and barely equaling it, usually strongly geniculate; anthers 1 to $1\frac{1}{2}$ lines long.

Along the seashore in rocky or marshy places, from Pt. Reyes northward. June-July. A tall coarse species, forming large tufts.

3. *C. angusta* Kearney. NARROW REED-GRASS. Perennial; stems few, slender, $2\frac{1}{4}$ to $3\frac{3}{4}$ ft. high; ligule about 2 lines long, apex broad, truncate or rounded; blades not filiform, all strongly involute, at least above; panicle spikelike, narrow and dense, strict, $4\frac{1}{2}$ to 7 in. long, sometimes interrupted below; branches short, appressed, the lower in threes; spikelets densely crowded, about 3 lines long, strongly compressed; bracts subequal, rather sharply keeled; awn from near the base of the bractlet, and shorter than or not much exceeding the bracts, $1\frac{1}{2}$ lines long, stout; anthers $1\frac{1}{2}$ lines long.

The type, which appears to be the only specimen so far known, is from Santa Cruz.

4. *C. subflexuosa* Kearney. FLEXUOUS REED-GRASS. Stems tufted, slender, erect, 2 to 3 ft. high; sheaths minutely scabrid; ligule 1 to 2 lines long, apex slightly truncate; blades strongly involute, but not filiform; panicle 4 to 6 in. long, oblong-lanceolate, narrow and dense, almost spiciform, often interrupted or lobed below, usually somewhat flexuous, brownish-purple; branches erect, in fours or sixes below, the longest about 2 in.; spikelets crowded, 2 to $2\frac{1}{2}$ lines long, strongly compressed; bracts subequal, about $2\frac{1}{2}$ lines long, sharply keeled, glabrous except the scabrid keel; bractlet and palea minutely 5-toothed; awn from a little above the base of the bractlet, about equaling the bracts, stout; anthers 1 line long.

Oakland Hills, Bolander, no. 2274; does not appear to have been re-collected. It resembles *C. aleutica*, but is said to be at once distinguishable by the short and narrow involute leaves and by the position of the awn.

5. *C. fasciculata* Kearney. A perennial "bunch-grass," densely tufted from a scaly, stoloniferous rootstock; stems 2 to $2\frac{1}{2}$ ft. high, stout, erect from a decumbent base, very leafy, densely clothed with the old, dry sheaths; the lowest sheaths bearded at the junction with the blade; ligule $1\frac{1}{2}$ lines long, serrate; blade about 1 line wide, flat or becoming involute, minutely scabrid, uppermost cauline $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, lowest cauline 5 to 6 in., those of the sterile shoots 6 to 10 in. long; panicle shortly exerted, narrowly lanceolate or almost linear, 2 to 4 in. long, 3 to 4 lines wide, interrupted below, dense and lobed above; branches short, appressed, densely-flowered to the base; longest $\frac{1}{2}$ to $\frac{3}{4}$ in. long; spikelets $\frac{3}{4}$ line long; bracts subequal, acute, scabrous; the upper the longer, about $2\frac{1}{2}$ lines long; prolongation of the rachilla minute, naked; bractlet exceeding the bracts, 3 lines long, prominently nerved; awn arising

about $\frac{2}{3}$ from the base, $1\frac{1}{2}$ lines long, shortly exceeding the bractlet; palea about 2 lines long.

Marin Co. northward: plentiful along the trail from Mill Valley Cascades to the reservoir, above the Redwoods. Aug-Sept.

6. *C. rubescens* Buckl. Differing from *C. fasciculata* in its usually elongated, not rigid leaves which rarely form a dense tuft, and by its narrow, spiciform, usually red-purple panicle.

Mt. Tamalpais acc. to Kearney.

15. *AMMOPHILA* Host. MARRAM-GRASS.

Tall perennial, with long, rigid leaves. Panicle large, contracted. Spikelets large, 1-flowered, much compressed laterally. Bracts persistent, scarcely exceeding the bractlets, sub-equal, rigid, thick, compressed-keeled, lanceolate, sub-acute, awnless; lower 1, upper 3-nerved. Rachilla terminating in a point beyond the insertion of the bractlet. Bractlet and palea similar in texture and about as long as the bracts; bractlet 5-nerved, minutely awned, with an oblique callus and a short tuft of silky hairs at base; awn minute, sub-terminal; palea 2-keeled, sulcate between the keels, 2-toothed. Scales very acuminate. Stamens 3. Ovary glabrous; styles short, distinct. (Greek ammos, sand, and philia, affection, from its preference for sand-dunes.)

1. *A. arenaria* (L.) Link. BEACH-GRASS. Rootstock widely creeping; stems 2 to 4 ft. high; sheaths long; ligule very long, 2-fid, torn; blades convolute and polished without, scabrid and glaucous within; panicle spike-like, sub-clindric-fusiform, 3 to 6 in. long, straight, broadest and sometimes lobed at the base, white or yellowish; pedicels scabrous; spikelets erect, 5 to 6 lines long; bracts $\frac{1}{3}$ to $\frac{1}{2}$ in. long; keel scabrid; hairs and prolongation of the rachilla less than $\frac{1}{2}$ as long as the spikelet; anthers $\frac{1}{4}$ in. long, linear, yellow.—(*A. arundinacea* Host.)

Introduced from Europe into California about 1876, by Mr. Louis McLane, at the instigation of Prof. Geo. Davidson, for binding the drifting coast-sands of Golden Gate Park. Now thoroughly established at Golden Gate Park, Pt. Lobos and South Beach, as well as at Pt. Reyes and Pt. Arena. July.

TRIBE 5. *Aveneae*. OATS TRIBE.

Inflorescence in lax, rarely contracted panicles, or in *Danthonia* sometimes reduced to a raceme of 1 to 10 terminal spikelets. Spikelets all alike, usually with 2 or more perfect flowers (1 perfect and 1 staminate in *Holcus* and *Arrhenatherum*; rarely 1-flowered by abortion in *Deschampsia* and *Trisetum*), the imperfect flowers when present, uppermost (except in *Arrhenatherum*). Bracts large in proportion to the whole spikelet, usually exceeding the uppermost bractlet. Rachilla, except in *Holcus*, jointed above the bracts so that these persist after the flower has fallen, prolonged beyond the insertion of the uppermost flower except in *Aira*. Bractlet usually awned on the back, rarely from between the teeth of the 2-fid apex; awns usually geniculate and twisted.

A. Bracts readily deciduous with the flower.

Spikelet strictly 2-flowered; lower flower perfect, its bractlet awnless; upper flower staminate (or rarely perfect), its bractlet with a short awn.....16. *HOLCUS*.

B. Bracts persistent after the flower has fallen.

Rachilla not prolonged beyond the insertion of the upper flower; spikelets strictly 2-flowered.

Bractlets hyaline, 2-toothed, dorsally awned; flowers closely superposed.....17. *AIRA*. Rachilla prolonged beyond the insertion of the upper flower; spikelets (in ours) 2 (rarely only 1 in *Deschampsia* and *Trisetum*) to many-flowered.

- Awn of the bractlet arising from below the teeth of the apex, not from between them.
 Lower flower always perfect; the uppermost sometimes staminate or reduced to its bractlet.
 Spikelets less than 5 lines long (excluding the awn); achene free from the bractlet and palea, unfurrowed.
 Bractlet finely erose-dentate, or 2-lobed, or truncate and entire; spikelets strictly 2, rarely 1-flowered.....18. *DESCHAMPSIA*.
 Bractlet cleft or 2-toothed, with the teeth sometimes produced into awns; lowest flower awned; spikelets 2 to 6-flowered, often shining.....19. *TRisetum*.
 Spikelets more than 5 lines long (excluding the awn); achene usually adnate to its bractlet and palea, furrowed.....20. *AVENA*.
 Lower flower staminate, strongly awned from near the base; the upper perfect, awnless or short-awned at the apex.....21. *ARRHENATHERUM*.
 Awn of the bractlet arising from between its lobes or teeth; the teeth in many cases prolonged into straight awns.....22. *DANTHONIA*.

16. *HOLCUS* L. VELVET-GRASS.

Leaf-blades flat. Spikelets much compressed laterally, 2-flowered; pedicels jointed below the bracts, so that these are readily deciduous with the flower. Bracts 2, boat-shaped, keeled; lower 1-nerved; upper larger, 3-nerved, notched, acute or sometimes shortly awned. Rachilla shortly prolonged beyond the insertion of the uppermost flower-enclosing bractlet, sometimes terminated by a minute rudimentary bractlet. Lower flower perfect; upper staminate. Bractlets shorter than the bracts, 3-nerved; that of the lower flower awnless, of the upper with a short dorsal somewhat twisted awn. Palea 2-nerved, truncate, 3-toothed. Scales oblique, acuminate. Stamens 3. Ovary glabrous; stigmas sessile. (*Holkos*, a Greek name for some grass, perhaps derived from *holkos*, attractive.)

1. *H. lanatus* L. MESQUIT-GRASS. Perennial; rootstock creeping, fibrous; stems tufted, ascending, 1 to 2 ft. high, slender, leafy; sheaths densely soft-pubescent, the uppermost inflated; ligule short; blades soft; panicle pyramidal 2 to 5 in. long, pale green or pinkish; branches 2 to 3-nate; spikelets about 2 lines long, elliptic-oblong, the awn erect and often exerted before anthesis, then incurved and scarcely or not at all protruded; bracts acute, ciliate on the keels, nerves prominent; anthers rich purplish-brown.

A conspicuous softly-woolly pale-colored grass of moist bottom lands. Naturalized from Europe. San Francisco; Cobb Mt.; Olema; Pt. Reyes; Guerneville.

17. *AIRA* L. HAIR-GRASS.

Slender, dwarf annuals. Leaf-blades setaceous. Panicle-branches capillary, sub-erect. Spikelets less than 2 lines long, in ours strictly 2-flowered; bracts thinly scarious; rachilla not prolonged beyond the insertion of the upper bractlet. Bractlets thin, scarious, not projecting beyond the bracts; awn dorsal, short, hair-like. Near to *Avena* in technical characters, but spikelets much smaller.—(Greek *aira*, the name of a weed in wheat-fields, probably *Lolium temulentum*; from *airein*, to hurt, on account of its poisonous qualities.)

Panicle-branches much divided and bearing tufts of spikelets at the ends; bractlet of each flower awned.....1. *A. caryophyllea*.
 Panicle more open; spikelets less numerous and not tufted, smaller; bractlet of the lower flower awnless, of the upper awned.....2. *A. capillaris*.

1. *A. caryophyllea* L. SILVERY HAIR-GRASS. Slender, graceful, tufted grass, 8 to 13 in. high; sheaths scabrid, often pinkish at the base; blades short, fine, ephemeral; panicle loose; branches long, much divided, and bearing usually dense tufts of spikelets at the ends; pedicels 1 to 2½ lines long, scabrid; spikelets 1¼ lines long; bracts widely gaping at the apex, shining above, thinly scarious, the flowers plainly discernible through them; bractlet

brownish, long-acuminate, 2-fid; that of each flower awned; awns protruding $\frac{1}{2}$ line or more.

Naturalized from Europe, now common on old cattle ranges from Humboldt Co. to Monterey. May-Aug.

2. *A. capillaris* Host. FINE HAIR-GRASS. Resembling *A. caryophylla* but the panicle much more open; spikelets less numerous and not tufted, only 1 line long; pedicels longer and sometimes glabrous; bractlet of the lower flower awnless, of the upper awned; awns hygroscopic.

Naturalized from southern Europe: Marin and Humboldt cos., and probably occurring elsewhere.

18. DESCHAMPSIA Beauv. TICKLE-GRASS.

Panicle mostly open (rarely contracted), branches slender. Spikelets small, 2-flowered; flowers both perfect, somewhat distant, lower sub-sessile, upper pedicellate; rachilla jointed, hairy, prolonged beyond the insertion of the upper flower-enclosing bractlet as a hairy bristle which is sometimes terminated by an empty bractlet. Bracts equaling or exceeding the uppermost flower-enclosing bractlet, thin membranaceous, 1 to 3-nerved, keeled, acute, the margins and apex thinly scarious. Bractlet membranaceous or nearly hyaline, 2-toothed or cleft, or truncate and denticulate, with a fine dorsal awn below the middle; palea narrow, prominently 2-nerved, often 2-toothed. Stamens 3. (Dr. Deschamps, a French physician and naturalist of St. Omer, naturalist to the La Perouse relief expedition. Grasses with the shining spikelets of *Trisetum* and *Aira*, usually smaller than in the former, larger than in the latter, with which genus they were formerly united; stems usually stouter than in *Aira*.)

Stems stout, from a tufted rootstock; bracts barely equaling, and mostly shorter than the whole spikelet; the lower 1-nerved; panicle contracted, erect or somewhat drooping, dense and somewhat spikeletlike; branches short, stoutish; awn stout, straight.

1. *D. holciformis*.

Stems slender, weak; bracts exceeding the uppermost bractlet.

Perennial; panicle slender and spikeletlike, mostly nodding.

Panicle-branches several at a node, very unequal in length, mostly appressed, bearing many spikelets; spikelets $1\frac{1}{2}$ to 2 lines long; bractlet obscurely nerved or nerveless; achene grooved.....2. *D. elongata*.

Panicle racemose, 1 to 2 in. long; branches appressed, with few spikelets.

Diminutive plant, 3 to 4 in. high.....2. *D. elongata*.

Annual; panicle effuse, erect, its branches mostly in 3s below, in pairs or solitary above, distant, mostly spreading and bearing few (about 5) spikelets at the ends; spikelets $2\frac{1}{2}$ to $4\frac{1}{2}$ lines long; bractlet 5-nerved.....3. *D. calycina*.

1. *D. holciformis* Presl. CALIFORNIA TICKLE-GRASS. Perennial; rootstock forming large, dense tufts; stems 2 to 5 ft. high, stout, arising from a dense tuft of involute leaves; ligule 1 to 2 lines long; panicle contracted, dense, erect or somewhat drooping, 6 to 10 in. long; branches many at a node, sub-erect, the longest $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, branched and spikelet-bearing almost to the base; spikelets $2\frac{1}{2}$ to 3 lines long, short-pedicled, usually purplish-tinted below, yellowish to brown above; bracts barely equaling, and mostly shorter than the whole spikelet, acute; bractlet membranaceous, silky-hairy at base, rather regularly 4-toothed; awn stout, about $1\frac{1}{2}$ lines long, inserted near the base of the bractlet, usually shortly exserted; anthers 1 line long, purplish.—(*Aira holciformis* Steud.)

Wet meadows and borders of streams: Oakland Hills; San Francisco; Pt. Reyes; Mark West Ck. Apr.-July.

2. *D. elongata* (Hook.) Munro. SLENDER HAIR-GRASS. Perennial; stems very slender and weak, 8 to 24 in. high or more, from a dense tuft of

bright green, fine, smooth, short, very narrow leaves; ligule acute, 2 lines long; panicle very long and narrow; branches several at a node, distant, mostly appressed, capillary, scabrous, spikelet-bearing above the middle; pedicels somewhat clavate; spikelets many, $1\frac{1}{2}$ to 2 lines long; bracts linear-subulate, acuminate, nearly equal, 3-nerved, green, exceeding the uppermost bractlet; bractlet 1 line long, smooth and shining, with a tuft of silky hairs at base, irregularly 5-toothed or lacerate at apex; the lower and its flower on a short callus; the upper upon a very hairy internode $\frac{2}{3}$ as long as the lower; awn arising from near the base of the bractlet and twice its length, very slender and long-exserted.—(*Aira elongata* Hook.)

Moist places along the coast northward to Oregon. Var. *CILIATA* Vasey. Stems 2 to $2\frac{3}{4}$ ft. high; ligule 4 lines long; blades involute and softer; panicle often 12 in. long; awns longer than in the type.—Lake Pilareitos; Olema. June-Aug. Var. *TENUIS* Vasey. Very small plant, 3 to 4 in. high, with soft, hair-like, bright-green foliage; ligule long, white; panicle racemose, 1 to 2 in. long; branches appressed, with few spikelets.—Moist places, Santa Clara Co. May.

3. *D. calycina* Presl. TICKLE-GRASS. Annual; stems slender, from a few inches to 2 ft. high, simple, often growing in dense masses, rarely geniculate and sparingly branched below; leaves few, short, narrow and ephemeral; ligule 1 to $1\frac{1}{2}$ lines long, acuminate; panicle simple, very loose and open or narrow, about $\frac{1}{3}$ the length of the stem; branches mostly in 3s below, in pairs or solitary above, bearing few (about 5) spikelets upon the upper part, naked below; spikelets $2\frac{1}{2}$ to $4\frac{1}{2}$ lines long; lower flower on a short callus, its bractlet overlapping that of the upper flower; bractlet about 1 line long, hairy below, shining above, 5-nerved; apex emarginate, with 4 minutely ciliate teeth; awn inserted below the middle, about 3 times as long as the bractlet, light brown, twisted below and bent near the middle.—(*Aira danthonioides* of Bot. Calif.)

Common in the San Francisco Bay region and elsewhere in the State, on poor clay soils: St. Helena; Montezuma Hills; Kenwood; Santa Cruz. Apr.-June.

19. *TRisetum* Pers. OAT-GRASS.

Leaf-blades flat. Panicle usually open, narrow, more or less drooping above; branches in whorls, slender, erect, spreading or drooping. Spikelets 2 to 5-flowered. Bracts mostly shorter than the whole spikelet, unequal, keeled, membranaceous; margins scarious; lower bract 1 to 3, upper 3-nerved; rachilla extending beyond the insertion of the uppermost flower-enclosing bractlet, and terminated by an empty bractlet or a slender awn. Flower-enclosing bractlets like the bracts in texture, keeled, 5-nerved, acuminate, ending in two long, subulate teeth, with a long, bent and twisted awn arising from between them; palea 2-nerved and 2-toothed. Ovary hairy or smooth; stigmas almost sessile. Achene smooth, not furrowed. (Latin *tris*, three, and *saeta*, a bristle, referring to the awn-like points which terminate the bractlet in many species.)

Panicle-branches more or less spreading or sub-erect.

Spikelets large, 6 to 12 lines long, 2 to 3 lines wide, 3 to 8-flowered, resembling those of a *Bromus*; rachilla nearly glabrous, bractlets hirsute.....1. *T. barbatum*.

Spikelets small, 3 to 6 lines long, about 1 line wide, 2 to 3 (rarely 4)-flowered; rachilla clothed with long hairs, bractlets sub-glabrous; lower bract about $\frac{1}{2}$ as long as the upper; panicle-branches spikelet-bearing on the upper half....2. *T. nutkaense*.

Panicle-branches short, erect, the whorls not widely separated.

Spikelets small, 3 to 4 lines long; lower bract only about $\frac{1}{4}$ shorter than the upper; bractlets imbricate, minutely puberulent; panicle-branches mostly spikelet-bearing to the base.....3. *T. canescens*.

1. **T. barbatum** Steud. BROME-LIKE OAT-GRASS. Annual; stem usually solitary, 2 to 3 ft. high; sheaths hirsute with spreading hairs arising from minute tuberculations, glabrescent in age; blades 6 in. long, 2 to 3 lines wide, pilose-ciliate when young, sub-glabrous with age; panicle lax, 4 to 9 in. long; branches slender, sub-erect, lower bearing 2 to 4, upper only 1 spikelet; spikelets 6 to 12 lines long, 2 to 3 lines wide, 5 to 8-flowered, much flattened, resembling those of a *Bromus*; bracts narrow, acuminate, scabrous on the keel, 3-nerved, nearly reaching to the apex of the nearest bractlet; internodes of the rachilla short, nearly smooth; bractlet 5 to 6 lines long, hirsute all over; teeth subulate; awn stout, twisted below, then bent outwards, 6 to 8 lines long.—(*Bromus barbatoideus* Beal.)

Near thickets on hillsides, San Francisco; also reported from Oakland. Mar.-June.

2. **T. nutkaense** (Presl.) Scrib. & Merrill. NODDING OAT-GRASS. Perennial; stems 2 to 3 ft. high, slender, in tufts; leaf-blades 6 to 9 in. long, $1\frac{1}{2}$ to 6 lines wide, varying from sub-glabrous to pilose; panicle 4 to 10 in. long, at first narrow and slender, becoming very open, drooping above; branches in remote whorls, at first erect, then drooping, long, capillary, scabrous, bearing 2 to 3 or rarely 4 spikelets above the middle; spikelets 3 to 6 lines long, 1 line wide; bracts very unequal, the lower narrow, subulate; upper about $\frac{1}{2}$ longer, broad, 3-nerved, obtuse and mucronate; rachilla clothed with long, silky hairs, internodes 1 to $1\frac{1}{2}$ lines long, the lowest shorter than the others, the terminal bearing an empty bractlet or a long, slender awn; bractlet 2 to 3 lines long, smooth or scabrid; teeth long and subulate; awn slender, about twice the length of its bractlet.—(*T. cernuum* Trin.)

Shady thickets in northern and middle California. Mar.-June.

3. **T. canescens** Buckl. SILVERY OAT-GRASS. Perennial; stems 1 to 4 ft. high, stout, erect; sheaths varying from glabrous to densely pubescent; ligule $1\frac{1}{2}$ lines long, acute; panicle 5 to 12 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide, pubescent, strict, narrow, more or less densely-flowered, often purple-tinged; branches erect, somewhat crowded, all but the longest bearing spikelets to the base, longest $2\frac{1}{2}$ in. long; spikelets about 4 lines long, narrow, 2 to 3-flowered; lower bract narrow, acute, about $\frac{1}{4}$ shorter than the broad upper one; bractlets not spreading nor very remote, imbricate, 3 to 4 lines long, narrow, minutely puberulent, long subulate-pointed; awn stout, about twice the length of its bractlet.

Dry open ground or open woods and thickets: Coast Ranges northward to Oregon and in the Sierra Nevada. Apr.-Sept.

20. AVENA L. OATS.

Ours annual. Stems sub-solitary. Leaf-blades flat. Panicle lax; the branches unequal, and bearing few, pendulous spikelets on slender, geniculate, abruptly clavate pedicels. Spikelets 2 to many (rarely only 1)-flowered, the uppermost flowers staminate or abortive. Bracts 2, persistent, unequally nerved. Rachilla jointed above the bracts between the perfect flowers. Bractlet rounded on the back, the apex (in ours) shortly 2-fid, the back bearing a stout awn, mostly geniculate and twisted below; palea narrow, 2-dentate or 2-fid, 2-keeled. Scales 2-fid. Stamens 3; anthers sub-basifixed. Ovary and achene

hairy, at least at the top; styles short, distant. (*Avena*, the old Latin name for Oats.)

Awn short or often obsolete, not geniculate; bractlet 7-nerved, glabrous or with a few long hairs at the base.....2. *A. sativa*.
Awn 10 to 24 lines long, geniculate.

Bractlet acute but not awn-pointed, 9-nerved, the 2 marginal nerves fine, sometimes not continued to the apex.....1. *A. fatua*.

Bractlet acuminate, awn-pointed, 7-nerved.....3. *A. barbata*.

1. **A. fatua** L. WILD OATS. Stems stoutish, 2 to 3½ ft. high; ligule short, lacerate; blades long and broad, scabrid; panicle 6 to 14 in. long; branches few at a node, very unequal, long and filiform; spikelets drooping, 2 to 3 (rarely only 1)-flowered, broad; bracts subequal, ovate-lanceolate, acute, 10 to 12 lines long excluding the awn, 9 to 11-nerved; bractlet less than 10 lines long, acute, 2-fid, 3½ lines wide, firm, thinly hairy with usually yellowish hairs, especially below, brown, 9-nerved; that of the uppermost flower subglabrous; awn from near the middle of the bractlet, stout, 10 to 20 lines long, geniculate; palea about 7 lines long, and 1½ wide, with short divergent hairs on the nerves.

Not uncommon in the Bay region: San Jose; Mt. Hamilton; Danville; Livermore. May-Aug. Var. **GLABRESCENS** Coss. Bastard Oats, is distinguished by having the bractlet naked except for a few short hairs at the base, and sometimes a thin pubescence along the margins, in which it approaches *A. sativa*; from the latter it may be distinguished by the longer and geniculate awn and the wider 9-nerved bractlet.—San Bernardino; San Jose; Berkeley.

2. **A. sativa** L. COMMON OATS. Near to *A. fatua*, but distinguished by its usually shorter stature, by the 7-nerved bractlet being glabrous (or bearing a few long hairs at the base), and by the often short, straight awn which is sometimes obsolete.

An escape in the borders of fields and by the roadside.

3. **A. barbata** Brot. BARBED OATS. Stems slender, erect, 2 to 3½ ft. high; uppermost ligule 1 to 1½ lines long, broad, obtuse, truncate, irregularly notched; blades 1 to 3½ lines broad, scabrous on both surfaces; panicle usually 6 to 12 in. long, shorter in dry localities and seasons; branches few at a node, very unequal, long and filiform; spikelets 2 to several-flowered, narrow and slender; bracts subequal, oval-lanceolate, setaceous-pointed, 10 to 12 lines long, with 7, 9 or 11 broadly green-margined nerves; margins scarious, shining; bractlet 10 to 12 lines long, including the long, slender, awn-pointed teeth, 2½ lines wide, lanceolate, membranaceous, clothed with soft, silky, usually white hairs, 7-nerved; awn from near the middle of the bractlet, stout, geniculate, 11 to 20 lines long; palea 6½ lines long, 1 line wide, with short divergent hairs on the nerves; anthers 1½ lines long; ovary densely hairy with long, white, silky, erect hairs.

A montane species, native of S. Europe and naturalized extensively in California in the Coast Range hills, and Southern California: San Jose, Lake Merced, Olema, Angel Island, Livermore, Berkeley. Feb.-Aug. Often mistaken for *A. fatua*, from which it may be distinguished without difficulty, when once known, by its more slender inflorescence and spikelets.

21. **ARRHENATHERUM** Beauv.

Perennial, usually tall grasses. Leaf-blades flat. Spikelets terete, strictly 2-flowered; rachilla jointed between the flowers, often hairy, prolonged beyond the insertion of the uppermost bractlet as a short point or bristle; lower

flower staminate, upper pistillate or perfect. Bracts persistent, scarious (in ours), very unequal, shortly acuminate, keeled. Bractlets rigid, 5 to 7-nerved, 2-toothed, that of the lower flower with a long, basal, bent and twisted awn, that of the upper with a short, dorsal awn; palea 2-nerved. Scales lanceolate, laterally toothed. Stamens 3. (Greek arrhen, masculine, ather, awn; only the male flower is conspicuously awned.)

1. **A. elatius** (L.) Beauv. TALL OAT-GRASS. Rootstock perennial, widely creeping; stems 2 to 4 ft. high, erect, slender, smooth, leafy, often densely tufted; lowest internode sometimes developed into a corm; leaves bright green; sheaths smooth; ligule broad, obtuse, about 1 line long; blades soft, minutely scabrid, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines wide; panicle narrow, pale green, shining, 6 to 8 in. long, drooping; branches short, erect, scabrid, spreading in flower, densely whorled, bearing few spikelets; spikelets 3 to 4 lines long; upper bract enclosing the 2 flowers acute; lower much smaller; bractlet hairy below, about half as long as the twisted, bent awn.—(*A. avenaceum* Beauv.; *Avena elatior* L.)

Sparingly naturalized in California: reported from the vicinity of San Francisco (Dr. Behr); Berkeley Hills (J. B. Davy). June-Sept.

22. DANTHONIA DC.

Inflorescence in ours consisting of a paniculate raceme or simple panicle or the spikelets solitary and terminal. Spikelets about 7-flowered. Bracts persistent, nearly equal, keeled, awnless, equaling the whole spikelet, 3 to 9 (rarely only 1)-nerved. Rachilla jointed and pilose between the flowers, prolonged beyond the insertion of the uppermost bractlet. Flowers all perfect, or the uppermost staminate. Bractlet 7 to 13-nerved, terminating in 2 sharp, usually rigidly awn-pointed teeth, between which is a geniculate, spreading awn, flattened at the base and spirally twisted, formed from the three middle nerves; palea hyaline, broadly 2-nerved, equaling or exceeding the entire portion of the bractlet, obtuse or 2-toothed. Stamens 3. Scales 2, entire. Ovary smooth, stipitate. (Etienne Danthoine, a French botanist of the 18th century.)

1. **D. californica** Boland. DANTHONIA. Tufted perennial; stems $1\frac{1}{2}$ to 3 ft. high, slender, usually sub-erect; sheaths bearded at the throat, densely or sparsely villous, or smooth, the hairs arising from minute, white papillae; ligule obscure; blades mostly convolute-setaceous; spikelets 1 to 5 rarely 10, terminal, $7\frac{1}{2}$ to 12 lines long, usually purplish; pedicels long, slender, minutely and densely hirsute, spreading; bracts enclosing the rest of the spikelet, acuminate, 8 to 10 lines long; flowers about 7; bractlet broad, coriaceous below, about 4 lines long excluding the awn, with tufts of white hairs on the callus and on the margins from about the middle downwards; its teeth about 2 lines long; awn spreading, barely exerted, brownish below, with short, spreading hairs on the nerves; palea ciliate, notched above; achene about 2 lines long.

Coast Ranges from San Francisco Bay northward and southward, the prevalent grass on dry hills, especially along the coast: Berkeley; San Francisco; Crystal Springs Lake; Olema; Pt. Reyes.

TRIBE 6. Chlorideae. FINGER-GRASS TRIBE.

Inflorescence a simple panicle of spikes which are usually digitate at the end of, or scattered along, its main axis, or, rarely, solitary and terminal. Rachis not jointed or notched as in *Hordeae*. Spikelets sessile in 2 rows, which form unilateral spikes; in ours all perfect and 1 or rarely 2-flowered;

lowest flower always perfect. Rachilla usually prolonged beyond the insertion of the terminal flower, and (except in *Spartina*) jointed above the bracts so that these persist after the flowers have fallen. Bractlet usually keeled, entire and unawned, or toothed and with 1 or 3 terminal straight awns. The inflorescence closely resembles that of *Paspalum*, but the spikelets resemble those of *Festuceae*.

Spikes digitate; prostrate, running grass, rooting at the nodes.....23. *CYNODON*. Spikes scattered along the main axis of the panicle; erect plants.

Bracts very unequal, long, narrow, acuminate; tidal creeks and marshes.....24. *SPARTINA*.

Bracts equal, short, broad and boat-shaped, abruptly acute; sloughs and banks of rivers and streams25. *BECKMANNIA*.

23. *CYNODON* Rich. DOG'S-TOOTH-GRASS.

Perennial. Leaf-blades narrow, usually flat, often short. Panicle branches 2 to 6, digitate at the apex of the peduncle, erect or radially spreading. Spikelets alternate, sessile (in ours) on one side of the rachis, 1-flowered. Bracts 2, persistent, often narrow, keeled; rachilla jointed above the bracts and often prolonged beyond the base of the bractlet as a bristle. Bractlet boat-shaped, distinctly keeled; palea often shorter and narrower, hyaline, 2-nerved. Stamens 3. Achene glabrous, not channeled. (Greek *kuon*, a dog, odous, a tooth.)

1. *C. dactylon* (L.) Pers. BERMUDA-GRASS. Stems prostrate, creeping, often several feet in length, clothed with undeveloped sheaths, producing roots and tufts of leaves at the nodes and often one or more prostrate, barren branches; flowering stems 4 to 24 in. high, leafy; sheaths much crowded, loose, strongly striate; ligule short, ciliate with long hairs; blades about 1 in. long and a line wide, stiff and sometimes involute, glaucous; panicle-branches 3 to 6, 1 or 2 in. long, concavo-convex; spikelets about 1 line long, appressed, closely imbricate; bracts shorter than the bractlet, ovate-lanceolate, nearly equal, usually spreading, rough on the keel or not; bractlet smooth, keel and margins ciliate; palea narrow.—(*Capriola dactylon* Ktze.)

Tropical species naturalized in California and frequently occurring as a roadside weed on the outskirts of towns, especially in the warm interior valleys; in the Coast Ranges at San Rafael, Pacheco, Berkeley and Alameda. Apr.-Oct.

24. *SPARTINA* Schreb. CORD-GRASS.

Mostly maritime perennials. Stems simple, erect, reed-like but short. Leaf-blades long, tough. Panicle narrow, erect, dense, composed of several erect, approximate spikes; spikelets large, compressed, more or less imbricate, in rows on two sides of the triangular panicle-branches, 1-flowered. Bracts unequal, keeled, acute, or bristle-pointed, about as long as the whole spikelet; rachilla sometimes prolonged beyond the insertion of the flower. Bractlet subhyaline, faintly 2-nerved; palea equaling it or longer. Scales short, obtuse. Stamens 3. Style-branches long, slender. (Greek *spartine*, a rope or cord made of *spartos*, *Spartium junceum* and *Stipa tenacissima*.)

1. *S. foliosa* Trin. CORD-GRASS. Rootstock creeping, scaly; stems very stout, 1½ to 4 ft. high; leaf-blades long, flat, smooth, tapering from about 3 lines wide near the middle to long, slender points; panicle 6 to 9 in. long; branches 2 to 3 in. long; spikelets ½ in. long; bracts varying from glabrous to strongly ciliate on the keels. —(*S. striata* var. *glabra* of 1st. ed.)

Common along the borders of salt-marshes around San Francisco and San Pablo bays, usually, if not always, within reach of tidal water. Aug.-Dec.

25. **BECKMANNIA** Host.

Leaf-blades flat. Panicle long, narrow, erect, dense, composed of several approximate, erect racemed spikes. Spikelets crowded in 2 rows on the 2 lower sides of the sub-triangular panicle-branches, imbricate, compressed, 2 (or by abortion) 1-flowered, 1 to $1\frac{1}{2}$ lines long. Bracts broadly inflated and somewhat boat-shaped, laterally compressed, sub-equal, obtuse or abruptly pointed; margins scarious. Bractlet narrow, concave-keeled, membranaceous, 5-nerved; palea hyaline, 2-keeled, nearly as long as the bractlet. Stamens 3. (J. Beckmann, 1739-1811, the author of a "Lexicon Botanicum.")

1. **B. erucaeformis** (L.) Host. SLOUGH-GRASS. Stems 2 to 3 ft. high, stoutish, strict, solitary or somewhat tufted, erect from a slightly decumbent base, leafy; sheaths slightly rough; ligule elongated; blades 4 to 8 in. long, 3 to 4 lines wide, roughish; panicle 8 to 12 in. long; branches solitary or in twos or threes, sometimes again shortly branched, densely clothed with spikelets in 2 rows; spikelets about $1\frac{1}{2}$ lines long, nearly orbicular or broadly obovate; bracts with 3 principal nerves, and some transverse ones, dark green on the keel, paler and somewhat wrinkled transversely; bractlet pointed, the point often exserted.

Sloughs, borders of streams and wet bottom lands in mountain regions from Santa Clara Co. northward to Willits. Apr.-July. Somewhat resembling a Panicum.

TRIBE 7. **Festuceae.** FESCUE TRIBE.

Inflorescence paniculate or racemose, the racemes sometimes almost spicate on account of the very short pedicels of the spikelets. Spikelets 2 to many-flowered (rarely 1-flowered in *Melica*, *Koeleria*, *Festuca* and *Lamarkia*); flowers perfect or the uppermost imperfect (the lowest imperfect in *Phragmites*); in *Lamarkia* one spikelet at each node is perfect, the others being sterile; in *Distichlis*, some species of *Poa* and sometimes in *Phragmites* the flowers are dioecious or polygamo-dioecious. Bracts rarely reaching the apex of the nearest bractlet. Bractlet in ours entire or 2-toothed or 2-cleft, awnless or with 1 (in ours never 2 to 5) awns; awn straight, terminal at the apex or from between the teeth, never dorsal nor bent and twisted as in *Aveneae* and *Agrostideae*. Palea 2-keeled.

A. Rachilla or bractlet, at least that of the perfect flower, clothed with long, erect hairs which envelop the latter; bractlet (in ours) thin-membranaceous or hyaline, 3-nerved; tall, reed-like grasses.

Bractlet hairy; rachilla naked.....26. **ARUNDO.**
Bractlet naked; rachilla hairy.....27. **PHRAGMITES.**

B. Rachilla and bractlet naked, or if hairy the hairs much shorter than the bracts and bractlet; stigmas (in ours) plumose, comparatively short, either sessile or raised on a short style protruding from the sides of the bractlet.

Spikelets of two kinds at each node, very dissimilar in form, one perfect and 1 to 3-flowered; the others sterile and composed of many empty bractlets.

Perfect spikelets 1-flowered, the sterile consisting of about 10 empty bractlets which are obtuse.....35. **LAMARKIA.**
Spikelets alike in form though sometimes dioecious.

Flowers dioecious; rootstock perennial.

Spikelets 8 to 16-flowered, rootstock very stout and creeping, scaly; panicle dense, ovoid; grasses of salt-marshes or alkali soils.....32. **DISTICHLIS.**

Spikelets 2 to 6-flowered; rootstock tufted or if creeping then long and slender.... 36. **POA.**

Flowers all perfect, or perfect and imperfect in the same spikelet.

Both bracts and bractlets awnless.

Bractlet 1 to 3-nerved.

- Annuals; panicle more or less lax; spikelets many (sometimes 70)-flowered, the flowers densely imbricate; palea persistent after the bractlet and achene have fallen.....28. ERAGROSTIS.
- Perennials; panicle contracted and spikelike, dense or slightly interrupted, silvery shining; spikelets 2 to 7 (rarely only 1)-flowered.....29. KOELERIA.
- Bractlet 3 to 5-nerved.
- Perennials; uppermost flower-enclosing bractlet enwrapping 1 to 3 smaller empty bractlets, which in ours are truncate-clavate.....30. MELICA.
- Bractlet 5 to many-nerved.
- Spikelets large, flattened, ovate, somewhat cordate at base; bractlet very obtuse, concave, becoming ventricose; annuals.....33. BRIZA.
- Spikelets not cordate, mostly smaller.
- Bractlet laterally compressed, mostly keeled, the margins or nerves below clothed with cobwebby hairs, or pubescent, its lateral nerves arched, converging above toward the mid-nerve.....36. POA.
- Bractlet rounded on the back, at least below, naked at the base, its lateral nerves nearly parallel, scarcely or not at all converging..37. PANICULARIA.
- Either bracts or bractlets awned, awn-pointed or mucronate.*
- Palea with conspicuously toothed marginal wings on the keels; bractlet with a straight, rigid awn; annuals of wet meadows, with weak stems, and pale greenish-yellow foliage.....31. PLEUROPOGON.
- Palea without marginal wings on the keel.
- Panicle contracted and spikelike, dense or slightly interrupted, silvery-shining. 29. KOELERIA.
- Panicle 1-sided, glomerate or interrupted; spikelets in dense ovoid 1-sided fascicles.....34. DACTYLIS.
- Panicle more or less lax, not dense and spikelike.
- Stigmas plainly arising at or near the apex of the ovary; ovary and achene in most cases smooth; bractlet not notched or 2-lobed, usually awned or awn-pointed38. FESTUCA.
- Stigmas plainly arising below the apex of the ovary, on the anterior portion; ovary and achene crowned by a little appendage or tuft of short hairs; achene always adnate to the palea; bractlet usually distinctly notched or shortly 2-lobed at the apex, with an awn between the notches..39. BROMUS.

26. ARUNDO L.

Perennial reeds; stems tall, stout, erect. Leaf-blades broad, flat. Spikelets 2 to 6-flowered, in a dense and somewhat spreading panicle. Bracts somewhat unequal, keeled, 3-nerved. Rachilla naked, jointed above the bracts and between the flowers. Flowers crowded, all perfect or the upper staminate. Bractlet slender, 2-toothed and with an awn or cuspidate point between the teeth, clothed with long, silky hairs. Palea shorter, hyaline, pubescent on the keels. Stamens 3. Ovary naked. (Latin *arundo*, a reed or cane.)

1. **A. donax** L. GIANT REED. Rootstock very stout, creeping, tufted; roots stout, fibrous; stems in dense clumps, 10 to 20 ft. high, mostly with short, slender branches from the upper nodes, leafy throughout; leaves pale green; sheath striate, bearded and somewhat auricled at the throat; ligule about 1 line long, barely exerted, truncate, entire, uniform in width all around; blade striate, mostly 2 to 3 in. wide, the uppermost $1\frac{1}{2}$ to 2 ft. long; spikelets 5 to 7 lines long, 2 to 3-flowered; bracts equaling the whole spikelet, lanceolate-acuminate, entire, awnless, glabrous; bractlet acuminate; awn often twice the length of the teeth.

Introduced as an ornamental plant and occasionally met with as an escape. It is not known to flower with us. Alameda Marshes.

27. PHRAGMITES Trin.

Perennial water-reed. Stems tall, stout. Leaf-blades flat. Panicle large, much branched, feathery. Spikelets sub-terete. Bracts short, unequal, membranaceous, keeled. Rachilla terminating in a rudimentary bractlet or point, elongated and jointed between the flowers, the joints clothed, except below

the lowest flower, with long, silky hairs which surround the bractlets. Bractlets 3 to 6, very long-acuminate, 3-nerved, entire; the lowest empty or bearing a staminate flower with 1 to 3 stamens, the upper bearing perfect flowers with 3 stamens; palea very much shorter than its bractlet, hyaline, 2-ribbed. Scales large, obtuse. Ovary glabrous. (A Greek name used by Dioscorides for some plant; from phragmites, of or for a fence, growing in hedges; perhaps originally applied to *Arundo donax*, which is still used in Latin and Spanish-American countries for living hedges.)

1. *P. vulgaris* (Lam.) B. S. P. COMMON REED. Rootstock creeping, jointed; stems 5 to 12 ft. high, leafy throughout; sheaths smooth; ligule reduced to a minute ring of hairs; blades smooth-surfaced, rough-margined, 12 to 16 in. long or more, often 1 in. broad, rigid, attenuate-pointed, glaucescent below; panicle 10 to 18 in. long, ovoid, dense, soft, usually dull purple, nodding; branches glabrous; spikelets $\frac{1}{2}$ to $\frac{3}{4}$ in. long; bracts lanceolate, not equaling the nearest bractlet; bractlets very narrow, subulate, the tip of the lowest sometimes twisted.—(*P. communis* Trin.; *P. phragmites* Karst.)

Borders of rivers, lakes and marshes: Upper Lake; Suisun Marshes; lower Sacramento. Aug.-Oct.

28. ERAGROSTIS Beauv.

Ours low tufted or creeping annuals. Panicle sometimes spike-like and clustered, often loose and spreading. Spikelets much like those of species of *Poa*; usually densely many (sometimes 70)-flowered. Bracts usually not equaling the nearest bractlet, unequal, keeled; lower 1-nerved, upper 1 to 3-nerved. Rachilla in ours not jointed between the flowers. Flowers all perfect or variously unisexual, or the uppermost (rarely the lowest) reduced to its bractlet and palea. Bractlet membranaceous, awnless, keeled, 3-nerved; lateral nerves sometimes obscure; palea shorter, 2-nerved or 2-keeled, often incurved, frequently persistent after the bracts and bractlet have fallen. Stamens 2 or 3; anther-lobes notched along the edges. Scales 2, sub-cuneate. Styles distinct, elongated. (Greek *era*, earth, *agrostis*, a kind of grass, from the low stature of some species.)

1. *E. hypnoides* (Lam.) B. S. P. CREEPING MEADOW-GRASS. Stems slender, creeping, 2 to 12 in. long, branching freely at the nodes; nodes with a ring of short, spreading hairs, leafy; sheaths $\frac{1}{2}$ in. or less long; blades $\frac{1}{2}$ to 2 in. long, $\frac{1}{2}$ to 1 line wide, sparingly hairy; panicle ovoid or densely pyramidal-capitate, $\frac{1}{2}$ to 2 in. long; spikelets very shortly pedicellate, oblong to elliptical or ovate, laterally flattened, 2 to 7 or even 14 lines long, 10 to 40-flowered; bracts less than $\frac{1}{2}$ as long as the nearest bractlet; bractlet lanceolate, acute, compressed-keeled, 5-nerved; keel scabrous-ciliate.—(*E. repans* Nees.)

Wet places, San Joaquin and Coast Range valleys, perhaps not indigenous. Mar.-Oct.

2. *E. minor* Host. CANDY-GRASS. Stems tufted, 4 to 24 in. high; ligule reduced to a hairy ring; blades 1 to 6 in. long, 1 to 3 lines wide, flat or involute, margins and mid-nerve glandular below; panicle open or rather dense, oblong or ovate, 3 to 5 in. long, olive-green or tinged with lead-color when young, whitish when old; spikelets oblong or lance-oblong, 3 to 10 lines long, 8 to 20-flowered, pedicels glandular; bracts sub-equal, a little shorter than the nearest bractlet, acute, keel glandular; bractlet about 1 line long, oval or elliptical, obtuse or mucronulate, concave, 5-nerved, glandular on the mid-nerve; achene ovoid, light brown, mottled.

Native of S. Europe; reported by Dr. Behr as occurring at San Francisco. Var. *MEGASTACHYA* (Gray) Davy. STINK-GRASS. Differs in having denser panicles and usually larger and more numerous (10 to 50)-flowered spikelets. —Adventive in the San Joaquin Valley at Tulare.

29. *KOELERIA* Pers. KOELER-GRASS.

Panicle contracted, cylindrical, spike-like. Spikelets oblong, compressed, 2 to 5 or 7 (rarely only 1)-flowered. Bracts scarcely equaling the lowest bractlet, unequal, narrow, compressed, acute or produced into short, straight awns or points, keeled, membranous and broadly scarious-margined; lower 1, upper 3-nerved with rather faint nerves. Rachilla often prolonged beyond the uppermost flower and bearing a rudiment or none. Bractlets imbricate, membranous, acuminate, keeled, 3 or rarely 5-nerved; palea hyaline, 2-fid. Scales 2, oblique. Stamens 3. Ovary glabrous; styles short. Achene almost linear, plano-convex. (Prof. G. L. Koeler, a German Agrostologist, author of "Descriptio Graminum," published in 1802. A genus for which it is hard to assign any very distinctive technical character. The panicle is peculiarly silvery-shining and the bracts are more scarious and more faintly nerved than in related genera.)

1. *K. cristata* (L.) Pers. CRESTED KOELER-GRASS. Tufted pale green glabrous, pubescent or silky perennial; rootstock stoloniferous; stems 1 to 3 ft. high, slender; sheaths striate; ligule $\frac{1}{2}$ to 1 line long, truncate, lacerate; blades about $\frac{1}{2}$ line wide, flat or conduplicate, $\frac{1}{2}$ to 5 in. long; panicle narrow, more or less interrupted or lobed, 1 to 5 in. long; rachis puberulent or pubescent; branches very short, pubescent, spikelet-bearing to the base; spikelets shortly pedicellate, 2 to 3 lines long, pale green, shining; bractlet linear-lanceolate, scabrid, acute or mucronate; palea minutely ciliate and scabrid on the keels; anthers 1 line long, pale purple.

Exceedingly variable species, common on dry hills and sandy tracts: Montezuma Hills; Vaca Mts.; San Francisco; Berkeley Hills; Antioch. Apr.-June. Var. *PUBESCENS* Vasey, a very pubescent form, has been collected near San Francisco. Var. *LONGIFOLIA* Vasey, a long-leaved form, is reported from Santa Cruz Co. by Dr. Anderson.

30. *MELICA* L. MELIC-GRASS.

Stems often forming corns at the base by the thickening of 1 or 2 of the lowest internodes. Panicle sparingly branched, often narrow, rarely racemose and secund. Spikelets 2 to 8 (rarely 1)-flowered, terminated by 1 to 3 much smaller, convolute, empty bractlets which enfold one another, the innermost often truncate-clavate. Bracts awnless, unequal, convex, mostly obtuse; upper 5 to 9-nerved, lateral nerves often vanishing in the broad, scarious margin and united by delicate cross-veins. Bractlets somewhat distant, awnless, convex or flattish on the back, 5 to many-nerved; apex scarious, mostly blunt, entire or 2-toothed; central nerves sometimes slightly excurrent; palea 2-nerved, ciliate above, emarginate or 2-toothed. Scales fleshy, mostly united. Styles distinct; stigmas plumose. (Greek name for some sweet grass, perhaps *Sorghum*, from *meli*, honey, and *-ika*, a Greek suffix.)

Spikelets of 1 (rarely 2) flowers; bractlet herbaceo-coriaceous, with a narrow scarious margin above, strongly 7 to 9-nerved; stems not corn-like at the base.

Bracts obtuse, shorter than the whole spikelet; bractlet glabrous or scabrid; rudiment shortly pedicellate. 1. *M. imperfecta*.

Upper bract acute, equaling the whole spikelet; bractlet hairy above the middle; rudiment long-pedicellate. 2. *M. torreyana*.

Spikelets of 2 to 3 perfect flowers; bractlet apparently many-nerved below (at least when dry), with a broad, scarious margin above; lowest internodes swollen and corm-like; ligule brown and pubescent or scabrid below; bractlet 3 to $3\frac{1}{2}$ lines long, obtuse, emarginate.....3. *M. californica*.

1. *M. imperfecta* Trin. SLENDER MELIC-GRASS. Stems slender, erect or drooping, 1 to 3 ft. high; lowest internodes not corm-like; leaf-blades 1 line wide; panicle slender, linear, 6 to 12 in. long; branches in distant whorls, several at a node, erect or sometimes in anthesis spreading, very unequal, the longest mostly equaling or exceeding the internodes, spikelet-bearing from about the middle upwards; spikelets $1\frac{1}{2}$ to 2 lines long, 1-flowered with 1 or 2 empty bractlets above it, rarely 2-flowered; bracts nearly ovate, shorter than the nearest bractlet, obtuse, lower 3, upper 5-nerved; margins broadly scarious; bractlet acute; rudiment short-pedicellate.

Shaded hillsides in the Coast Ranges: Mt. Tamalpais; San Francisco; Loma Prieta; Oakland and northward and southward. Apr.

2. *M. torreyana* Scribn. TORREY'S MELIC-GRASS. Stems slender, erect or drooping, 1 to 3 ft. high; lowest internodes not corm-like; blades about $1\frac{1}{2}$ lines wide; panicle slender, linear, 3 to 7 in. long; branches few at a node, very unequal, slender, erect, flexuous, often long and naked below, bearing few spikelets near the ends; spikelets 2 to 3 lines long; bracts acute, the upper exceeding or equaling the bractlets; bractlets hairy; rudiment long pedicellate.

Apparently peculiar to the Coast Ranges (Conn Valley, Ukiah) and Sierra Nevada foothills. Apr.-May.

3. *M. californica* Scribn. CALIFORNIA MELIC-GRASS. Stems erect, $1\frac{1}{2}$ to 4 ft. high; lower internodes corm-like; ligule brownish and pubescent or scabrid on the outside below; panicle 6 to 9 in. long, strict; branches few at a node, usually equaling or exceeding the internode, spikelet-bearing to the base; spikelets 4 to 5 lines long, of 2 to 3 perfect flowers; bracts thin, obtuse; bractlet 3 to $3\frac{1}{2}$ lines long, apparently many-nerved below at least when dry, margin above scarious, broad, obtuse, emarginate.—(*M. bulbosa* Thurb. in Bot. Cal., not of Geyer.)

Dry foothills of the Sierra Nevada and Coast Ranges. Apr.-June.

31. PLEUROPOGON R. Br. SIDE-BEARD.

Slender annuals. Leaf-blades flat, together with the sheaths thin and characterized by cross-veins which unite the longitudinal ones and with them form narrow, rectangular spaces. Inflorescence a simple, elongated, secund raceme; spikelets distant, shortly pedicellate, long, narrow, 8 to 14-flowered, compressed. Bracts not reaching to the apex of the nearest bractlet, unequal, membranaceous, awnless; lower 1-nerved, upper larger, 3-nerved, the lateral nerves faint. Rachilla jointed between the flowers and breaking up at maturity, undulate, smooth, its internodes less than $\frac{1}{2}$ the length of the bractlets. Bractlet at first herbaceous, becoming chartaceo-coriaceous, scarious and prominently 5 to 7-nerved, narrowed below to a rounded, smooth callus, apex 2-toothed or truncate, the mid-nerve prolonged into a mucro or short, straight, rigid awn; palea 2-nerved and with two winged toothed keels; margins infolded. Stamens 3. Scales short, fleshy, connate. Ovary smooth, ovoid, stipitate. Achene somewhat compressed, strongly furrowed, hard; pericarp loose, 2-horned with the remains of the style-bases. (Greek pleuron, side, pogon, beard, from the arrangement of the awns at the sides of the spikelets.)

1. *P. californicum* (Nees) Vasey. CALIFORNIA SIDE-BEARD. Stems stoutish but weak, $1\frac{1}{2}$ to 3 ft. long, tufted, simple, smooth; lower nodes rooting;

leaves pale yellowish-green; sheaths smooth, striate; ligule prominent, thin, about 3 lines long; lowest blades 6 to 7 in. long, $1\frac{1}{2}$ to 2 lines wide, linear, acute, minutely scabrid above; raceme 6 to 9 in. long; spikelets 6 to 12, sub-erect or spreading, solitary, $\frac{1}{2}$ to 2 in. apart, 1 in. long, yellowish, 11 to 14-flowered; pedicels flattened, 1 to 3 lines long; tips of the bracts and bractlets shining with a silvery luster; bracts 2 to 3 lines long; apex irregularly denticulate; nerves prominent; upper bract the longer; bractlets $2\frac{1}{2}$ to 3 lines long, rough-scabrous, the three central nerves united above to form the awn; awn $1\frac{1}{2}$ to 5 lines long; palea rough on the herbaceous parts; appendages to the keel with 1 prominent stout, acuminate tooth and several irregular smaller ones.—(*Lophochlaena californica* Nees.)

Apparently restricted to California; wet meadows and marshy ground, rare: Mt. Eden; Oakland Hills; Walnut Creek; Ross Valley; San Francisco. May-June.

32. DISTICHLIS Raf. SALT-GRASS.

Diococious perennial. Panicle densely spike-like; branches erect, often bearing 2 to 3 spikelets. Spikelets many-flowered, laterally compressed, shortly pedicellate. Bracts narrow, keeled, faintly many-nerved, awnless. Bractlet obscurely many-nerved, awnless; palea with enfolded margins, keeled; keels narrowly winged or prominent, ciliate. Scales broad. Staminate flowers with 3 stamens, their ovaries rudimentary or obsolete; pistillate occasionally with imperfect stamens. Ovary glabrous, stipitate, tapering into 2 rather long styles. (Greek *distichlia*, a double row, probably having reference to the leaf arrangement.)

1. *D. spicata* (L.) Greene. SALT-GRASS. Rootstock stout, creeping, scaly; stems stout, rigid, erect, 4 to 18 in. high, often branched below, leafy throughout; leaves pale green, strictly 2-ranked; sheaths glabrous, slightly bearded at the throat; ligule reduced to a mere ring; blade $1\frac{1}{2}$ to 4, rarely 7, in. long, $1\frac{1}{2}$ lines wide at the base, spreading, rigid, margins minutely ciliate; panicle 1 to 3 in. long, pale green; branches appressed; spikelet-bearing to the base; spikelets 4 to 6 lines long, 5 to 12-flowered, keeled; bracts shorter than the lowest bractlet, unequal, obtuse; bractlets keeled, obtuse, green, purplish or straw-colored; anthers purplish.—(*D. maritima* Raf.)

Common throughout the State in salt marshes or on alkaline plains. Aug.

33. BRIZA L. QUAKING-GRASS.

Leaf-blades narrow. Panicle effuse, branches slender, in $\frac{1}{4}$ whorls. Spikelets pendulous, large, ovate or somewhat cordate, flattish-turgid, many-flowered; pedicels capillary. Bracts subequal, broad, rounded on the back, 3 or 5 to 11-nerved, awnless. Rachilla jointed between the flowers. Bractlets imbricate, roundish, boat-shaped or saccate, scarious-margined, many-nerved, in ours very obtuse; uppermost often empty; palea small, ovate, flat, its nerves ciliate. Scales 2, ovate-lanceolate. Stamens 3. Ovary glabrous; styles short. Achene strongly ob-compressed, broadly ovoid. (Ancient Greek name, used by Galen for a kind of grain, "like rye," grown in Thrace and Macedonia.) Spikelets 4 lines or less long.

Perennial; ligule $\frac{1}{2}$ to 1 line long; spikelets ovate; bracts not equaling the nearest bractlet; leaves smooth.....1. *B. media*.

Annual; ligule $1\frac{1}{2}$ to 3 lines long; spikelets deltoid; bracts exceeding the nearest bractlet; leaves scabrous.....2. *B. minor*.

Spikelets 6 lines long and at the base almost as broad; bracts dark brown, with broad, scarious margins; bractlets chestnut-brown.....3. *B. maxima*.

1. *B. media* L., PERENNIAL QUAKING-GRASS, has been reported from various

points in the State but all the specimens we have seen under this name are referable to *B. minor*.

2. *B. minor* L. ANNUAL QUAKING-GRASS. Annual; ligule $1\frac{1}{2}$ to 3 lines long; blades scabrous; spikelets deltoid, the bracts extending farther outward on each side than do the adjacent bractlets.

Naturalized: San Francisco; Mt. Tamalpais; Lake San Andreas; Mill Valley; Olema and northward.

3. *B. maxima* L. RATTLESNAKE-GRASS. Annual, 16 to 24 in. high; spikelets $\frac{1}{2}$ in. long and almost as broad at the base; bracts dark brown with broad, scarious margins; bractlets chestnut-brown.

A garden escape at Healdsburg and Monterey.

34. DACTYLIS L.

Perennial. Panicle usually dense and branched, secund, glomerate and interrupted, bearing thick, crowded, secund fascicles of spikelets at the ends of the short branches. Spikelets sessile, laterally much compressed, somewhat concave on the inner side, 3 to 5 or rarely only 1-flowered, the terminal bractlet and palea empty. Bracts mucronate, sharply keeled; lower 1-nerved; upper larger, 1 to 3-nerved. Rachilla glabrous. Bractlet larger than the bracts, sharply keeled and fringed on the keel, the 5 nerves converging into an awn-like scabrid point; palea as long, 2-fid, 2-nerved, nerves ciliate. Scales 2, with an acute, marginal tooth. Stamens 3. Ovary glabrous. (The ancient name for some grass with finger-like spikes, from Greek daktulos, a finger or finger's breadth.)

1. *D. glomerata* L. ORCHARD-GRASS. Rootstock tufted and somewhat creeping; stems at length forming large, dense tufts, erect from a shortly decumbent, leafy base, 2 to 3 ft. high, stout; leaves glaucescent; sheaths scabrid; ligule 2 to 6 lines long, laciniate; blades 2 to $3\frac{1}{2}$ lines wide, scabrous, soft; panicle 2 to 6 in. long, pinkish when in flower; branches solitary, scabrous, sub-erect, the lowest 1 to 4 in. long, branching and spikelet-bearing only at the ends; clusters of spikelets ovoid; spikelets $3\frac{1}{2}$ to 4 lines long; bracts about 3 lines long, subequal, strongly ciliate on the keel; bractlet 2 to 4 lines long, lanceolate, scabrid; anthers 1 to $1\frac{1}{2}$ lines long, cream-colored, apparently all in a spikelet maturing at the same time.

Native of Europe, naturalized at Berkeley, San Francisco, Olema and Eureka. June-Aug.

35. LAMARCKIA Moench.

Annual. Stems tufted, branching. Leaves flat. Panicle secund, racemose, short, dense; lowest branches bearing 1 to 3, uppermost only 1, spikelet. Spikelets spreading or drooping, fascicled, of two kinds; central spikelet, terminating the branch, bearing a perfect flower; lateral spikelets of ten or more empty, obtuse, awnless bractlets, denticulate above. Bracts narrow, slightly unequal. Perfect flower stipitate; rachilla prolonged beyond it and bearing a diminutive empty bractlet with a slender awn; flower-enclosing bractlet acute with a long, straight, dorsal awn near the apex; palea 2-keeled. Stamens 3. Styles short, distinct, barbellate almost throughout. (A monotypic genus, named in honor of La Marek, 1744-1829, a celebrated French botanist.)

1. *L. aurea* (L.) Moench. GOLDEN-TOP. Stems erect from a somewhat decumbent base, 4 to 14 in. high, smooth, leafy, sometimes branching below; sheaths inflated, smooth; ligule usually very prominent, $\frac{1}{2}$ to 6 lines long, decurrent as a broad, scarious margin to the mouth of the sheath; blades thin,

1½ to 4 in. long, 2½ to 4 lines wide; panicle dense, 1 to 3 in. long, ½ to 1 in. wide, shining, of a golden color sometimes tinged with purple; branches close, erect, short; pedicels fascicled, somewhat clavate, pubescent, spreading at right angles, the fascicles with a tuft of long, whitish hairs at the base; fertile spikelet about 1 line long; sterile 3 to 4 lines long; bracts very narrow, almost hyaline, about 1 line long; awn from a little below the apex of the bractlet, 3 to 4½ lines long.—(*Achyrodes aureum* Ktze.)

A Mediterranean Region species, now abundant in the interior southern portions of the State; within our limits collected only at Eden Vale (J. B. Davy).

36. POA L. MEADOW-GRASS.

Panicle usually open, sometimes dense and spike-like; branches in pairs or ½ whorls. Spikelets compressed, ovate or lanceolate, 2 to 6 or 9-flowered. Bracts unequal, keeled, awnless; lower 1 to 3-nerved; upper larger, 3-nerved. Rachilla jointed below each bractlet. Bractlet compressed-keeled, herbaceous or membranaceous, with the rachilla and callus often clothed below with webby hairs or pubescent, especially on the dorsal and marginal nerve; apex hyaline; nerves 5 to 7, the intermediate ones often faint; palea 2-fid, nerves 2, ciliate. Scales acute. Stamens 3 or (rarely) 2 only. Achene (in ours) mostly free from the bractlet and palea, not furrowed. (Greek poe, grass or herbage, especially that grown as forage for cattle, hence meadow-grass.)

Panicle open.

Annual; stems 2 to 12 in. high.....1. *P. annua*.

Perennial; stems 12 to 36 in. high; rootstock distinctly stoloniferous and running.....2. *P. pratensis*.

Panicle contracted, more or less dense and spike-like; perennials; flowers often dioecious or polygamo-dioecious.

Rootstock running, long and slender; coast sand-dunes.....3. *P. douglasii*.

Rootstock tufted, not running.

Panicle 3 to 4½ in. long; longest branches 1 to 2 in. long, spikelet-bearing on the upper three-fourths; bracts and bractlets not ciliate on the keels; bunch-grass of dry hillsides.....4. *P. secunda*.

Panicle 2 to 3 in. long; longest branches less than 1 in. long, densely spikelet-bearing almost to the base; bracts and bractlets scabrously ciliate on the keels; moist sandy places on the coast cliffs.....5. *P. unilateralis*.

1. *P. annua* L. WALK-GRASS. Annual; stems compressed, weak, geniculate below, 2 to 12 in. high; ligule 1 to 2 lines long; blades bright green, glabrous, 1 to 2 lines wide; panicle often 1-sided, 1½ to 3½ in. long; branches single or in pairs, rarely in threes, 7 to 12 lines long; spikelets sessile or shortly pedicellate, 2 to 2½ lines long, 3 to 7-flowered; bractlets somewhat pilose below.

Naturalized and widely distributed: Monterey; Berkeley; etc. A very troublesome weed on garden walks, hence the vernacular name; our earliest-flowering grass. Nov.-Apr.

2. *P. pratensis* L. KENTUCKY BLUE-GRASS. Perennial; rootstock distinctly running and stoloniferous; stem and sheaths smooth; panicle open-pyramidal, 3 to 4 in. long; spikelets crowded at the ends of the branches, almost sessile, 3 to 5-flowered; bractlets distinctly 5-nerved, webbed at the base.

Frequently met with as an escape from lawns: Berkeley. Apr.-May.

3. *P. douglasii* Nees. SAND-GRASS. Perennial; rootstock slender, widely creeping; stems tufted, 8 in. high; panicle dense, spike-like, ovoid, obtuse, 1 to 2 in. long; spikelets 3 to 6 lines long; flowers dioecious.

Apparently peculiar to California; common in drifting sands along the seashore: Monterey; San Francisco; Tiburon; Pt. Reyes; Bodega Pt. and northward. Apr.

4. *P. secunda* Presl. Tufted perennial; stems stout, rigid, erect, about $1\frac{1}{2}$ ft. high; sheaths minutely scabrid above; ligule $1\frac{1}{2}$ to 2 lines long, acute, glabrous or minutely pubescent on the back; blades short, flat or conduplicate, $\frac{3}{4}$ to 1 line wide; panicle 3 to $4\frac{1}{2}$ in. long, oblong, acute, contracted, densish; branches scabrous, erect, overlapping, about 3 at a node, the longest 1 to 2 in. long, spikelet-bearing on the upper three-fourths; spikelets $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, lanceolate-acuminate, 4 to 5-flowered; pedicels scabrous; bracts acute, scabrid, 3-nerved below, the nerves evanescent in the broad, scarious margin, $1\frac{1}{4}$ to $1\frac{3}{4}$ lines long; bractlet 2 lines long, acutish, scabrid above, pubescent on the nerves below, 5-nerved, all but the mid-nerve evanescent below the broadly-scarious apex; palea $1\frac{3}{4}$ lines long, emarginate, ciliate on the keels; anthers purple, 1 line long; ovary $\frac{1}{4}$ line long, stigmas $\frac{1}{2}$ line, achene a little over 1 line.—(*Atropis californica* Thurb. in Bot. Cal., in part; *A. fendleriana* Beal, in part.)

One of the "bunch-grasses" of dry hillsides, apparently quite widely distributed, though perhaps often confused with other species. Antioch; Angel Island, etc.

5. *P. unilateralis* Scribn. Tufted perennial; rootstock stout, not creeping; stems stout, erect or ascending from a decumbent base, 6 to 10 in. high, freely branching below; sheaths smooth, inflated and loose; ligule $1\frac{1}{2}$ to 3 lines long, acute; blades 1 to 3 in. long, flat or conduplicate, $\frac{3}{4}$ to $1\frac{1}{4}$ lines wide, abruptly acute; panicle stout, contracted, dense and spike-like, 1 to 3 in. long, $\frac{1}{2}$ in. broad, often one-sided; branches densely spikelet-bearing almost to the base, scabrous; spikelets almost sessile, 2 to 4 lines long; bracts acute, $1\frac{1}{2}$ lines long, 3-nerved, ciliate scabrous on the keel, minutely ciliate on the margins; rachilla pubescent; flowers 4 to 7, imperfectly dioecious; bractlet 2 lines long, acute when flattened out, faintly 5-nerved, scabrously ciliate on the mid-nerve, not woolly below; palea 2-fid, strongly ciliate on the keels; anthers yellow or purplish, 1 line long.

Moist sandy places on the coast bluffs north and south of San Francisco: Santa Cruz (type locality, Dr. Anderson); Pt. Reyes; Bodega Pt.; Pt. Arena. Apr.-June.

37. PANICULARIA Fabr. MANNA-GRASS.

Tall grasses of wet places. Stems smooth. Panicle-branches in $\frac{1}{2}$ whorls. Spikelets linear, sub-terete, many-flowered. Bracts not equaling the nearest bractlet, unequal, membranaceous, convex, awnless. Rachilla jointed below the bractlets. Bractlet caducous, cartilaginous, convex or flattish, not keeled; tip obtuse or slightly denticulate, usually scarious; nerves 3 to 9, conspicuous below, evanescent upwards; palea 2-fid, 2-keeled, nerves ciliate. Scales fleshy, united, truncate. Stamens 3. Ovary glabrous. (Latin panicula, a tuft or panicle on plants, having reference to the inflorescence.)

1. *P. pauciflora* (Presl.) Ktze. SMOOTH MANNA-GRASS. Stout perennial of fresh-water marshes; root-stock stout, creeping; stems 2 to 4 ft. high, stout, sometimes $2\frac{1}{2}$ lines in diameter, erect from a decumbent base, rooting at the lower nodes, leafy throughout; leaves about 6; sheaths split to the base, loose, smooth, pale green; ligule broad, obtuse, entire but soon becoming lacerate, 1 to $3\frac{1}{2}$ lines long; blade 4 to 12 in. long, 3 to $7\frac{1}{2}$ lines wide, flat, scabrous; panicle lax, narrow, 6 to 8 in. long, pale green; branches in $\frac{1}{2}$

whorls of 2 to 5 below, capillary and flexuous, rough, erect, somewhat remote, spikelet-bearing above the middle, the longest about $3\frac{1}{2}$ in. long; pedicels short; spikelets oblong, 2 to 3 lines long, 4 to 6-flowered; bracts less than $\frac{1}{2}$ the length of the nearest bractlet; lower 1-nerved, acute; upper rounded, 3-nerved; bractlet about 1 line long, prominently 5-nerved, scabrous, with a purplish border below the scarious truncate-obtuse serrulate apex.—(*Glyceria pauciflora* Presl.)

A common grass in fresh-water marshes of the Coast Ranges and Sierra Nevada: Lake Pilareitos; Olema; Guerneville and northward. Apr.-Aug.

38. *FESTUCA* Tourn. FESCUE-GRASS.

Leaves and flowers often rather harsh to the touch. Panicle various, loose and spreading or racemose and sometimes secund. Leaf-blades often auricled at the base. Spikelets sub-terete, 2 to many (rarely by abortion only 1)-flowered. Bracts 2 (rarely only 1), not equaling the nearest bractlet, membranaceous, acute; lower 1-nerved; upper larger, 3-nerved. Rachilla jointed below the bractlet. Bractlets not webby, convex, not keeled, chartaceous or nearly coriaceous, 3 to 5-nerved, mucronate or awned at or near the tip, uppermost sometimes empty; palea 2-toothed or 2-fid, nerves hairy. Scales 2, notched or 2-lobed. Stamens 1 to 3. Ovary usually glabrous; styles short, terminal. (Latin *festuca*, a slender shoot or straw; also used by Latin writers to designate some straw-like weed.)

Perennials.—*EUFESTUCA*.

Awns less than 2 lines long.

Stems slender, $\frac{1}{2}$ to 3 ft. high; ligule and auricles glabrous; rootstock tufted, sometimes stoloniferous; lowest bractlet $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long.....1. *F. rubra*.

Stems stout, 3 to 4 ft. high; ligule and auricles villous.....2. *F. californica*.

Awns 4 to 6 lines long.....3. *F. denticulata*.
Slender annuals; inflorescence a racemose panicle or raceme; awns $2\frac{1}{2}$ to 7 lines long.—

VULPIA.

Branches and spikelets mostly spreading; the latter 1 to 5-flowered; bracts sub-equal, the lower $\frac{1}{2}$ to $2\frac{1}{2}$ lines long.....4. *F. microstachys*.

Branches and spikelets erect, appressed; spikelets 5 to 8 (rarely only 3)-flowered; bracts often very unequal, sometimes subequal.....5. *F. myuros*.

1. *F. rubra* L. RED FESCUE. Rootstock perennial, tufted and sometimes stoloniferous; stems slender, erect, 2 to $2\frac{1}{2}$ ft. high, often purplish; sheaths smooth; blades very narrow and slender, almost setaceous, smooth, about $\frac{1}{4}$ line wide, 4 to 10 in. long; ligule very short; panicle 6 to 7 in. long, narrow, sparse or somewhat dense; rachis and branchlets scabrid, the latter erect, in pairs below, the longest about 3 in. long and bearing 3 to 5 spikelets on the upper $\frac{1}{2}$; pedicels about 3 lines long; spikelets 6 to 7 lines long, 6 to 8-flowered; bracts awnless, the lower 2, upper $2\frac{1}{2}$ lines long; bractlets $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, glabrous or minutely scabrous above, with a slender awn 1 to $1\frac{1}{2}$ lines long; anthers $1\frac{1}{2}$ to 2 lines long.—(*F. ovina* var. *rubra* Gray.)

Common in dry, exposed places: Vaca Mts.; Los Guilucos Valley and Hood's Peak; Pt. Isabel; Olema; San Francisco. Apr.-June.

2. *F. californica* Vasey. CALIFORNIA FESCUE. Rootstock perennial, forming large tufts; stems clothed with the dead sheaths below, 3 to 4 ft. high, stout; foliage glaucous; sheaths often lavender-colored at the base when young, scabrous; ligule and auricles villous without and within; panicle 6 to 9 in. long, drooping; rachis scabrid; branches in pairs below, spikelet-bearing above the middle; spikelets about $\frac{1}{2}$ in. long, 4 to 7-flowered; lower bract 2 to $3\frac{1}{2}$, upper $2\frac{1}{2}$ to 4 lines long; bractlets cuspidate or with a short

awn usually less than 1 line long, occasionally nearly 2 lines long; anthers purplish, $2\frac{1}{2}$ to 3 lines long.—(*F. scabrella* Thurb. in Bot. Cal., not of Hook.)

Forming large and ornamental tufts on the shady banks of cañons in the Coast Ranges: Oakland Hills; Olema; Pt. Reyes. Apr.-June.

3. *F. denticulata* Beal, is described as a stout and rather handsome grass, with loose and drooping panicle and conspicuous awns 4 to 6 lines long. The specimens on which the species was founded (as *F. ambigua* Vasey, not of Le Gall) were collected in Oregon by Thos. Howell, "California" by Kellogg and Harford, no. 1116, and Santa Cruz by Dr. Anderson.

4. *F. microstachys* (Munro) Nutt. WESTERN FESCUE. Annual; stems erect, 6 to 12, or in shady places, 24 in. high; panicle 1 to $5\frac{1}{2}$ in. long; branches secund, usually divergent, remote, the longest $1\frac{1}{4}$ to 2 in. long; spikelets remote, $2\frac{1}{2}$ to 5 lines long, 1 to 5-flowered; bracts glabrous or scabrous, awnless, sub-equal, upper about 2 lines long; lower $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long; bractlet $1\frac{1}{2}$ to 3 lines long, awn slender, $2\frac{1}{2}$ to 5 lines long.

Napa Valley; Highland Springs; Berkeley; Mt. Tamalpais; Cazadero. Apr.-July. Var. *PAUCIFLORA* Scribn. Inflorescence often reduced to a spike; spikelets 1 to 2-flowered.—Berkeley Hills. Var. *CILIATA* A. Gray. Bractlets, and sometimes the bracts also, densely hispid.—Not uncommon in the foothills of the San Joaquin Valley and in Southern California; apparently seldom met with in the Coast Range valleys: Napa City.

5. *F. myuros* L. SQUIRREL-TAIL FESCUE. The form of this variable annual species which is recognized in Europe and the eastern States as typical, *F. pseudo-myuros* Soyey-Willemet, does not appear to occur within our limits, if in California at all. It has the panicle 3 to 12 in. long, very slender and contracted; bracts unequal, the upper 2 to 3 times as long as the lower and usually little more than $\frac{1}{2}$ the length of the contiguous bractlet, exclusive of its awn; bractlet not ciliate. Var. *ciliata* Coss. is readily distinguished by the prominent marginal ciliation of the upper half of at least the uppermost bractlets, the marginal hairs being long, spreading and well exserted; bracts very unequal, the lower very short or minute, the upper 3 to 8 times longer, much as in var. *ambigua* Hook.; awn of the bractlet 3 to 7 lines long.—(*F. myuros* of Thurber in Bot. Cal. not of L.)

Native of the Mediterranean Region, naturalized in California from Mendocino Co. to San Bernardino: San Francisco; Solano Co.; Bodega Pt.; Berkeley Hills; Antioch. Apr.-June. Var. *SCIUROIDES* Coss. Upper portion of the stem usually well exserted from the sheath; panicle shorter than in typical *F. myuros*, usually 2 to 4 in. long, less contracted; bracts less unequal (in which it closely approaches *F. microstachys* Nutt.), lower 2 to 3 lines long, upper 4 lines long, nearly equaling the contiguous floret; bractlet glabrous below, minutely scabrous near the apex, not ciliate.—(*F. sciuroides* Roth.)—Closely related to the typical *F. myuros*, but differing from it in most of the above points and from *F. microstachys* in the more numerous flowers to the spikelet and the erect branches and spikelets. Native of Europe; now thoroughly naturalized and common in middle California: Bodega Point; Berkeley; Oakland; San Francisco. Mar.-June.

39. *BROMUS* L. BROME-GRASS.

Sheaths often closed; leaf-blades flat. Panicle usually open; branches slender and at length spreading, rarely dense or racemed with erect branches.

Spikelets 5 to many-flowered, laterally compressed or sub-terete, oval to lanceolate, erect or often drooping. Bracts not reaching to the apex of the lowest bractlet, membranaceous, acute, awnless; lower 1 to 5-nerved; upper 3 to 9-nerved. Rachilla jointed below the bractlets. Bractlets rounded on the back below, somewhat keeled above, 5 to 9-nerved, awned or bristle-pointed; awn mostly arising from a little below the usually shortly 2-fid, hyaline apex. Palea nearly as long as the bractlet, 2-fid, with 2 prominent, usually pectinate-ciliate keels. Ovary obovate or linear, crowned by a 2 to 3-lobed, hairy, membranaceous appendage; styles very short, more or less lateral, plainly arising below the apex of the ovary; stigmas feathery. Achene oblong or linear, often more or less conduplicate, grooved, adhering to the palea or more or less to the base of the bractlet. (Bromos, the ancient Greek name for a kind of oats, derived from broma, food. Closely allied to Festuca.)

Lower bract 1 to 3-nerved.

Perennial; spikelets narrow, sub-terete, acuminate before anthesis; awns $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long..... 1. *B. laevipes*.

Annual.

Bractlets 6 to 10; panicle contracted; awn slender, 6 to 9 lines long or less; ligule lacerate; panicle dense, obovate-cuneate, $1\frac{1}{2}$ to 2 in. long..... 2. *B. rubens*.

Bractlets 4 to 6; panicle lax; awn stout, rigid, over 1 in. long..... 3. *B. maximus*.

Lower bract 5 to 9-nerved.

Annual; panicle-branches short, erect..... 4. *B. hordeaceus*.

Perennial; panicle-branches long, drooping at maturity.

Stems 3 to 4 ft. high; panicle erect; awn $3\frac{1}{2}$ to 7 lines long; bracts unequal, lower 4 to 6, upper 5 to 7 lines long; rachilla pubescent..... 5. *B. hookerianus*.

Stems $1\frac{1}{2}$ to 3 ft. high; panicle drooping; awn 2 to $3\frac{1}{2}$ lines long; bracts sub-equal, about 6 lines long; rachilla puberulent..... 6. *B. carinatus*.

1. *B. laevipes* Shear. NODDING BROME. Perennial; stems slender, erect from an arcuate base, 2 to 3 ft. high; sheaths smooth or scabrid; blades flat, scabrid, 2 to 3 lines wide; panicle lax, drooping, 5 to 8 in. long; branches bearing few spikelets; spikelets drooping, narrow, subterete, acuminate before anthesis, 12 to 16 lines long, 5 to 9-flowered; bracts smooth, 1 to 3-nerved; internodes of rachilla $\frac{1}{2}$ to $1\frac{1}{2}$ lines long; bractlets 5 to $7\frac{1}{2}$ lines long, 7-nerved, the alternate nerves longer and more prominent, densely ciliate-pubescent on the margin nearly to the apex, and also on the back near the base; apex nearly flat, entire; awn $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

San Pablo Ridge; Hood's Peak, and northward in the Coast Ranges, in woodlands and among brush. May.

2. *B. rubens* L. RED BROME. Soft, densely tufted, slender annual, 8 to 16 in. high; ligule lacerate, 1 to 2 lines long; panicle obovate-cuneate, $1\frac{1}{2}$ to 2 in. long, erect, dense, tinged with reddish-brown, branches bearing 1 to 4 spikelets; spikelets 6 to 9-flowered; lower bract 3 to 5 lines long, lanceolate, 1-nerved, upper 5 to 7 lines long, 3-nerved; bractlets 7-nerved, awn 6 to 9 lines long.

Naturalized from southern Europe: Solano Co.; Contra Costa Co. Apr.-May.

3. *B. maximus* Desf. var. *gussoni* Parl. BRONCHO-GRASS. Annual; stems 1 to 2 ft. high; ligule $1\frac{1}{2}$ to 2 or 3 lines long, truncate, lacerate; blades 2 to 3 lines wide, flat, bright green, sparsely villous; panicle 5 to 8 in. long, at first erect, then drooping; lowest whorls 4 to 5-branched; longest branches less than twice the length of the spikelet; spikelets solitary or in pairs, often $1\frac{1}{2}$ in. long excluding the awns, linear-lanceolate, very scabrous, often purplish; bracts scarious except the nerves, very narrow, awn-pointed, 1 to 3-nerved; lower 7 to 10 lines; upper 11 to 14 lines long, long-acuminate; bractlets 4

to 6, thin, 7-nerved, 11 to 14 lines long with 2 long, hyaline teeth 2 to 3 lines long; awn $1\frac{1}{4}$ to 2 in. or more long, rigid, scabrous, arising from below the teeth; anthers $\frac{1}{2}$ line long, yellow.—(B. maximus of 1st ed.)

Native of the Mediterranean Region: naturalized at Stanford University; Berkeley; San Francisco; Suisun Marshes; San Jose; Tulare. Apr.-May. Now one of our most abundant grasses.

4. **B. hordeaceus** L. SOFT CHESS. Annual, erect, 1 to $1\frac{1}{2}$ ft. high; whole plant excepting the stems and uppermost sheaths, softly downy; ligule $\frac{1}{2}$ to $1\frac{1}{2}$ lines long, truncate, serrate, blades 2 to $4\frac{1}{2}$ lines wide; panicle 3 to 5 in. long, erect, rather dense; branches very short, erect; spikelets lanceolate, turgid, about 6 lines long, 5 to 9-flowered; bracts acute, with broad scarious margins and tips; lower 3 to 5-nerved; upper 7-nerved; bractlets closely imbricate, broadly oval, 7-nerved, margins and apex broadly scarious; awn from below the apex, slender, 1 to $2\frac{1}{2}$ lines long; palea distinctly ciliate; anthers yellow, $\frac{3}{4}$ line long.—(B. mollis L.)

Native of Europe, naturalized and very common by roadsides and in waste places within our limits and northward and southward. Sometimes called "Poverty-grass." Var. **GLABRESCENS** (Coss.) Shear, differs from the type in having the bractlet glabrous and shining or only scabrous.—Common at Berkeley.

5. **B. hookerianus** Shear. KEELED BROME. Perennial; stems stout, strictly erect, 3 to 4 ft. high, the sheaths almost closed, the lower hirsute with long, retrorsely spreading hairs or scabrid, upper sometimes glabrous; ligule about $2\frac{1}{2}$ lines long; blades 4 to 6 lines wide near the base, often hairy above; panicle 9 to 12 in. long; lower branches 4 or 5, in half whorls, long, scabrous, becoming drooping, shortly branched and bearing their few spikelets only above the middle; spikelets compressed, oblong, 12 to 15 lines long, 7 to 10-flowered; bracts unequal, lower 4 to 6, upper 5 lines long, 3 to 7-nerved; rachilla pubescent; bractlets 7 to 8 lines long, about 7-nerved, densely and minutely pubescent and scabrous; awn $3\frac{1}{2}$ to 7 lines long; anthers bright yellow.—(B. carinatus of 1st ed.)

Common in the Coast Ranges of middle California; also occurring in the upper San Joaquin Valley. May.

6. **B. carinatus** H. & A. Near to the preceding, but smaller in every way; stems slender, $1\frac{1}{2}$ to 3 ft. high, often drooping; sheaths more or less hirsute, prominently ciliate at the throat; panicle 4 to 9 in. long; spikelets more slender, 6 to 9 lines long, mostly 6 (rarely 10)-flowered; bracts sub-equal, 3 to $4\frac{1}{2}$ lines long; rachilla puberulent; bractlets closely imbricate; awn $1\frac{1}{2}$ to $3\frac{1}{2}$ lines long.—(B. marginatus of 1st ed.)

Common in the Coast Ranges from San Francisco to Eureka. May.

TRIBE 8. Hordeae. BARLEY TRIBE.

Inflorescence a simple, bilateral spike (rarely normally racemose or paniculate in some species of *Hordeum* and *Elymus*, and abnormally in monostrophies or luxuriant cultivated varieties of these and other genera). Rachis often flexuous, more or less flattened and toothed or deeply notched at the nodes; often, but not always, jointed at the nodes so that at maturity the internodes fall away with the attached spikelet; when the rachis is not jointed the rachilla is jointed above the bracts. Spikelets (in ours) in 2 opposite rows, solitary or 2 or more side by side at each node, sessile or very rarely pedicellate, all perfect or polygamous or when there are three at a

node the central perfect or polygamous, the two lateral sometimes imperfect, 1 to many-flowered, when many-flowered the uppermost flowers imperfect.

A. Spikelets sessile.

Spikelets solitary at the nodes of the rachis.

Flowers 1 or 2 in a spikelet; spike slender, the spikelets deeply sunk in notches of the rachis.—Subtribe LEPTURAE.

Bractlet awnless; callus naked.....40. LEPTURUS.

Bractlet awned; callus hairy.....41. SCRIBNERIA.

Flowers 3 or more in a spikelet.—Subtribe TRITICEAE.

Spikelets placed edgewise to the rachis, so that the backs of one row of bractlets are turned toward the notch; bract 1 only, except in the terminal spikelet.....

42. LOLIUM.

Spikelets placed flatwise to the rachis so that one side of each row of bractlets is turned toward the notch; bracts 2 to each spikelet.....43. AGROPYRON.

Flowers 2 or more side by side at the nodes of the rachis.—Subtribe ELYMEAE.

Flowers 2 or more in each spikelet; rachis joined at the nodes or not.

Bracts but little smaller than the bractlets.....44. ELYMUS.

Bracts minute, or obsolete and leaving only scars.....45. ASPERELLA.

Flowers solitary in each spikelet; rachis jointed at the nodes, each internode at maturity falling away with the attached spikelet.....46. HORDEUM.

B. Spikelets, at least the lateral ones, pedicellate.

Flowers 2 or more in each spikelet; rachis jointed at the nodes or not.....44. ELYMUS.

Flowers solitary in each spikelet; rachis jointed at the nodes, each internode at maturity falling away with the attached spikelet.....46. HOREDEM.

40. LEPTURUS R. Br. HARD-GRASS.

Ours slender, branching annuals. Inflorescence a simple, terminal, slender, cylindrical, jointed spike, at maturity each internode separating with the attached spikelet. Spikelets sessile, distichous, alternate, solitary in the notches of the axis, their backs turned towards the notches; uppermost spikelet terminal. Bracts 1 or 2, exceeding the bractlet, approximate in the lower, opposite in the upper spikelet, sub-equal, hard and rigid, narrow, 5-nerved, acute, awnless, one spreading when in flower. Flowers 2, or 1 with an empty bractlet above it. Bractlets sub-equal, hyaline, acute (in ours), awnless. Palea 2-nerved. Scales entire, glabrous. Stamens 3 or fewer. (Greek leptos, slender, oura, tail, referring to the slender, tail-like spikes.)

1. *L. cylindricus* Trin. CYLINDRICAL HARD-GRASS. Stems 12 to 14 in. high; spike 3 to 6 in. long, stout, cylindrical, straight; lateral spikelets with only 1 bract; bractlets acute.

Native of the Mediterranean Region; naturalized along the coast near San Francisco. June-July.

2. *L. incurvatus* (L.) Trin. CURVED HARD-GRASS. Usually has a more slender, incurved spike, with the lateral spikelets subtended by 2 bracts.

An alien weed, native of the Mediterranean Region: San Francisco; Martinez; Pt. Reyes. June-July.

41. SCRIBNERIA Hackel.

A low, slender, erect, tufted annual. Inflorescence a strict, slender, jointed spike, breaking up at maturity. Spikelets 1-flowered, sessile and half embedded in the notches of the rachis, solitary or rarely in pairs, alternate, long and slender. Bracts much exceeding the bractlet, persistent, unequal, linear-lanceolate, acute, awnless, eccentrically keeled, very rigid; upper 3 to 5-nerved, lower 2 to 3-nerved and ribbed. Rachilla very short, jointed above the bracts, with a ring of hairs surrounding the base of the bractlet, prolonged as a minute hairy point. Bractlet and palea sub-equal, keeled; bractlet chartaceous, 1-nerved, toothed at apex and bearing a stout awn about its own length from

between the teeth; palea hyaline, 1-nerved, acuminate and deeply 2-fid. Scales obsolete. Stamen 1. Ovary glabrous, narrowly obovate; stigma short, sessile, feathery. Achene linear-tapering, obtuse, free, slightly compressed laterally, not grooved; embryo prominent. (F. Lamson-Scribner, formerly agrostologist to the United States Department of Agriculture.)

1. **S. bolanderi** (Thurb.) Hackel. SCRIBNERIA. Stems 2 to 6 in. high, mostly simple, leafy; sheaths striate; ligule prominent, 1 to 2 lines long, acute; blades $\frac{3}{8}$ to $\frac{5}{8}$ in. long, narrow, involute, acute; spike $\frac{3}{4}$ to 2 or $4\frac{1}{2}$ in. long, erect, slightly flexuous or curved, purplish; spikelets about 3 lines long, usually exserted, scabrid.—(*Lepturus bolanderi* Thurb.)

Found in dry gravelly soils on hillsides and roadsides from Lake and Mendocino cos. northward to Oregon, and in the Sierra Nevada. Apr.-May.

42. **LOLIUM** L. RAY-GRASS.

Leaf-blades flat. Spike simple, solitary; rachis not jointed at the nodes. Spikelets in notches excavated alternately on opposite sides of the rachis, with the backs of one row of bractlets turned towards it, 3 to several-flowered, flattened laterally. Bracts 2 in the terminal spikelet, only 1 (the outermost) or 1 and a rudiment in the lateral spikelets. Rachilla jointed. Bractlet firm, 5-nerved. Palea ciliate. Stamens 3. Scales 2, mostly as long as the ovary. Ovary smooth or slightly downy at top; styles very short; stigmas feathery. (*Lolium*, the name used by Latin writers to designate Darnel, *Lolium temulentum*, and perhaps other grain-field weeds. At once distinguished from all other genera of the tribe *Hordeae* by the solitary flat spikelets, arranged distichously with one edge towards the rachis.)

Spikelet much flattened; bract shorter than the rachilla.....1. *L. perenne*.
Spikelet prominently turgid; bract equaling or exceeding the rachilla.....2. *L. temulentum*.

1. **L. perenne** L. AUSTRALIAN OR ENGLISH PERENNIAL RAY-GRASS. Perennial; stems 1 to 2 or even 3 ft. high, smooth; foliage dark-green; sheaths smooth, slightly compressed; ligule short; edges and upper surface of blade scabrid; spike 4 to 12 in. long, strict, stout, bearing 6 to 10 spikelets, or slender and bearing 3 to 4 spikelets; rachis smooth, channeled; spikelets $\frac{1}{3}$ to $\frac{1}{2}$ in. long, quite smooth, shining, 7 to 11-flowered; bracts strongly ribbed, linear-lanceolate; bractlet linear-oblong, terete, obtuse or cuspidate or rarely very shortly awned, ribbed; anthers purple.

Introduced as a forage plant and naturalized by roadsides and in waste places: Berkeley; Point Reyes, etc. Feb-Aug. Var. **TENU** Kunth (*L. tenue* L.). Pacey's Ray-grass. Perennial; more slender than the species; spikelets 3 to 4-flowered; bractlet acute, rarely very shortly awned. Var. **MULTIFLORUM** Auct. (*L. multiflorum* Lam.). Annual Italian Ray-grass. Annual (or at most only biennial); spikes very handsome, often reddish-tinged and curved; spikelets 10 to 25-flowered; bractlet sometimes awned, broader in the middle, and therefore appearing more curved on the margins than in var. *italicum*; rachis more scabrous.—Cloverdale; Berkeley. Var. **ITALICUM** Hook. (*L. italicum* R. Br.). Perennial Italian Ray-grass. Biennial or perennial; stems taller, leaves broader; both leaves and spikelets lighter green in color than in the species; spikelets 5 to 10-flowered; bractlets long- or short-awned.—A cultivated form not known in the wild state except as naturalized.

2. **L. temulentum** L. DARNEL. POISON-DARNEL. Annual; stem stout, 1 to 3 ft. high; spike rather stout; spikelets 5 to 10-flowered; bract sharp-pointed, ribbed, extending to the apex of or beyond the uppermost bractlet;

bractlet shorter, broader and more turgid than in *L. perenne*, terminating in an awn as long as the spikelet, or sometimes short-awned or awnless (var. *arvense* Syme); in other respects similar to *L. perenne*.

Naturalized from Europe: Berkeley; San Francisco; Antioch; Pt. Reyes and elsewhere as a weed in waste places. May.

43. AGROPYRON J. Gaertn. WHEAT-GRASS.

Ours perennials with very short ligule. Inflorescence a simple, slender, stiff and erect spike. Spikelets 3 to many-flowered, large, solitary, sessile, inserted broadside or somewhat obliquely to the rachis, distichous, compressed. Bracts not equaling the nearest bractlet, unequal, lanceolate or linear, many-nerved. Bractlet coriaceous, 5 to 7-nerved. Palea hyaline, flattened, usually ciliate-keeled. Scales ovate, entire, ciliate. Stamens 3. Ovary hairy at the apex; styles very short, distinct; stigmas distant, feathery. Achene hairy at apex. (Greek name for some allied grass, from *agros*, field, *puros*, wheat,—hence field- or wild-wheat.)

Bractlet long-awned.

- Bracts awnless; awns of bractlet 8 to 18 lines long.....1. *A. scabrum*.
 Bracts shortly awned; awn of bractlet 6 to 7 lines long.....2. *A. richardsoni*.
 Bractlet awnless or with a very short awn; bracts more than $\frac{3}{4}$ the length of the spikelet.
 Rootstock tufted, not stoloniferous.....3. *A. tenerum*.
 Rootstock long, slender, running and stoloniferous.....4. *A. arenicolum*.

1. ***A. scabrum* Beauv.** AUSTRALIAN WHEAT-GRASS. Stems stout, erect, 2 to 3 ft. high; blades short, involute, smooth below; spike 8 to 16 in. long; spikelets 10 to 14 in number, 1 to $1\frac{1}{4}$ in. long excluding awns, narrow, 6 to 10-flowered, the longest $\frac{3}{4}$ to $1\frac{1}{2}$ in. apart; bracts about 7 lines long, awnless, cartilaginous, pale green, with broad, scarious margins, smooth or minutely and sparsely scabrid, striate; bractlet chartaceous, with a broad, scarious margin, minutely scabrid; awn 8 to 18 lines long, mostly flexuous and widely divergent.

A pale glaucous Australian species, sparingly naturalized in California: San Jose, etc.

2. ***A. richardsonii* (Trin.) Schrad.** RICHARDSON'S WHEAT-GRASS. Stems stout, sub-solitary, erect, 3 to $3\frac{1}{2}$ ft. high; blades 2 to 6 in. long, $2\frac{1}{2}$ lines wide, setaceous-pointed, scabrous above, smooth below; spike 5 to 7 in. long; lowest spikelets about $\frac{1}{2}$ in. apart; spikelets 6 to 7 lines long without the awn, 3 to 4-flowered; bracts 5 to 7 lines long without the awn, scabrous on the many nerves, their awns about $2\frac{1}{2}$ lines long; awn of the bractlet 6 to 7 lines long, erect.

Oakland (H. N. Bolander); probably introduced, apparently not since collected. July.

3. ***A. tenerum* Vasey.** SLENDER WHEAT-GRASS. Rootstock tufted, not stoloniferous; stems slender, erect, from a slightly ascending, leafy base, 14 to 20 in. high; blades 1 to 6 in. long, 1 to $1\frac{3}{4}$ lines wide, flat, rough; spike $3\frac{1}{2}$ to 5 in. long; spikelets 13 to 16; bracts more than $\frac{3}{8}$ the length of the spikelet, awnless or awn-pointed, glabrous, scabrously-ciliate, broadest below the middle. —(*A. repens* var. *tenerum* Beal.)

San Mateo (H. N. Bolander).

4. ***A. arenicolum* Davy.** DUNE WHEAT-GRASS. Rootstock long, slender, creeping and stoloniferous; stems 6 in. high, erect or arcuate at base, clothed with dead sheaths below; branches intravaginal; sheaths glabrous; ligule reduced to a ring $\frac{1}{3}$ line long; blades convolute, glabrous below, above clothed with a sparse pubescence and deeply channeled, 6 to 10 in. long, 2 lines wide,

auricled at base, the auricle prolonged into a curved horn; spike $1\frac{1}{2}$ to 2 in. long; rachis almost smooth; spikelets approximate, $\frac{1}{2}$ in. long, 4 to 5-flowered; bracts 5 to $5\frac{1}{2}$ lines long, long-acuminate, subulate-pointed, ciliate, 3 to 5-nerved, coriaceous; bractlets broad, subulate-pointed, scabrid, coriaceous; palea ciliate.

A dwarf maritime species, apparently rare: type locality, sand-dunes at Pt. Reyes, *Davy*; Bodega Pt., *Eastwood*.

44. ELYMUS L. WILD RYE.

Perennials; stems tall and rigid. Leaf-blades usually broad. Spikes stout, cylindrical, usually dense. Spikelets 2 to 6 (sometimes only 1 above) at each node of the more or less flattened and notched rachis, placed sideways to the rachis, usually sessile, 2 to 7 (rarely only 1)-flowered. Bracts persistent, placed side by side in front of each spikelet so that those at a node together resemble an involucre, rarely divided into several awns (*E. sitanion*), firm, 1 to 5-nerved, linear or narrowly lanceolate-subulate. Rachilla jointed below the bractlets, terminating in a perfect or staminate flower or an empty bractlet. Bractlets usually coriaceous, rounded on the back. Palea 2-keeled. Scales large, usually ciliate. Stamens 3; anthers large. Ovary hairy; stigmas sessile or nearly so, distant. Achene oblong, hairy at the apex, grooved on the inside, adherent to the bractlet and palea. (Greek *elymos*, a kind of grain.)

Bractlet cuspidate or awn-pointed, but not long-awned.

Spikelets $\frac{3}{4}$ to 1 in. long; lowest bractlet 7 to 10 lines long; ligule about $\frac{1}{2}$ line long; stout grass of maritime dunes and sandy beaches.....1. *E. arenarius*.

Spikelets $\frac{3}{4}$ in. long or less; lowest bractlet 5 to 6 lines long.

Ligule about 1 line long; spike stout, usually dense, contracted; spikelets many; stout grass of moist places among the hills.....2. *E. condensatus*.

Ligule $\frac{1}{2}$ line long or less; spike slender; spikelets few; plant usually glaucous with a bluish bloom; slender grass of bottom lands in the warmer valleys.3. *E. triticoides*.

Bractlet with an awn mostly equaling or longer than itself.

Bracts entire, narrowly lanceolate-subulate, mostly acuminate or awn-pointed but not long-awned.

Rootstock creeping.

Awns erect; sheaths glabrous or retrorsely pubescent.

Ligule less than $\frac{1}{2}$ line long, regularly truncate.

Sheaths densely retrorsely pubescent.....4. *E. pubescens*.

Sheaths smooth or scabrid.....5. *E. glaucus*.

Ligule about 1 line long, rounded; bractlet hispidulous.....6. *E. hispidulus*.

Awns very divergent when dry, straight and erect when moistened; lower sheaths densely retrorsely pubescent.....7. *E. divergens*.

Rootstock not creeping; stems leafy and tufted.....8. *E. angustifolius*.

Bracts divided into long, slender awns which surround the spikelets as with an involucre.

9. *E. sitanion*.

1. *E. arenarius* L. RANCHERIA-GRASS. Glaucous; rootstock stout, widely creeping, stoloniferous; stems stout, erect, 3 to 6 ft. high; sheaths smooth, channeled; ligule a narrow truncate ring; blades 13 to 18 in. long, 4 to 6 lines wide, flat or with more or less convolute margins below, attenuate, rigid, auricled at the base, scabrous above, smooth below; spike 6 to 12 in. long, dense, erect; rachis broadly winged, pubescent and ciliate; spikelets large, in pairs or threes, imbricate, mostly appressed, $\frac{3}{4}$ to 1 in. long, about 6-flowered; bracts sub-equal, 7 to 12 lines long, rather shorter than the nearest bractlet, lanceolate-acuminate, 3 to 5-nerved, scabrous, sparingly ciliate with long hairs on the mid-nerve especially above; bractlet about 9 lines long including the long point, $1\frac{1}{2}$ lines wide, 8 to 9-nerved, glabrous or scabrid or sparingly pubescent; palea about 6 lines long, ciliate on the keels; anthers 3 lines long.

Common on maritime sand dunes, sandy beaches, and coast bluffs: San Francisco; Alameda Marshes; West Berkeley; Pt. Reyes. July-Aug.

2. *E. condensatus* Presl. CALIFORNIA WILD-RYE. Rootstock stout, creeping and stoloniferous; stems stout, erect, 3 to 6 ft. high; sheaths smooth; ligule about 1 line long, rounded, fimbriate; blades about 12. in. long, 4 to 5 lines wide, flat with more or less involute edges below, long-acuminate, smooth below, scabrous above; spike 5 to 8 in. long, compact, erect; rachis scabrous on the narrow wings; spikelets imbricate, appressed, in pairs, threes, or rarely more, when more than three then sometimes 1 or 2 are pedicellate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, somewhat turgid, 4 to 5-flowered; bracts subulate, rather shorter than the nearest bractlet, scabrid, about 6 lines long; bractlet scabrid at the apex, pulverulent below, more or less shining; lowest about $5\frac{1}{2}$ lines long, including the very short point, less than $1\frac{1}{2}$ lines wide, 7-nerved; palea $5\frac{1}{2}$ lines long; keels glabrous below, scabrous and ciliate above; anthers 2 to $2\frac{1}{2}$ lines long; scales about $\frac{3}{4}$ line long, ovate, ciliate.

Moist places, Coast Range hills; not uncommon within our limits: lower Sacramento River; Oakland Marshes; Port Costa; Berkeley Hills; Petaluma. Apr.-Sept.

3. *E. triticoides* Buckl. SLENDER WILD-RYE. Usually glaucous throughout; rootstock slender, creeping; stems slender or stoutish, erect, 2 to $3\frac{1}{2}$ ft. high; sheaths smooth; ligule reduced to a narrow, truncate, fimbriate ring; blades 6 to 12 in. long, $3\frac{1}{2}$ lines wide, flat or involute, scabrous on the margins and nerves especially above; spike about 6 in. long, erect, somewhat lax; rachis with a narrow, ciliate wing, puberulent; spikelets distant above and below, overlapping in the middle, somewhat divergent, in pairs or threes below, solitary above, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, turgid, 4 to 6-flowered; bracts sub-equal, 5 to 7 lines long, longer than, or equaling the nearest bractlet acuminate subulate, scabrous on the nerves above; bractlets 3 to 5 lines long including the point, $1\frac{1}{2}$ lines wide, 9-nerved, glabrous; palea $3\frac{1}{2}$ to 4 lines long, scabrous on the keels; anthers $2\frac{1}{2}$ lines long.

Apparently preferring bottom lands in the warmer valleys, sometimes in alkaline soils: Solano Co.; San Jose; Princeton. May-June.

4. *E. pubescens* Davy. PUBESCENT WILD-RYE. Erect perennial; rootstock stoloniferous; stems 2 to 3 ft. high, erect, slender, scabrid; sheaths densely retrorsely pubescent; ligule reduced to a truncate ring about $\frac{1}{2}$ line long, fimbriate in young leaves; blades 3 to $6\frac{1}{2}$ in. long, 2 to 3 lines wide, flat, auricled at base; spike 3 in. long; rachis with a narrow, ciliate wing; spikelets in pairs or often solitary, 4 to 5 lines long, few-flowered; bracts broadly linear-lanceolate, 5 lines long, about 1 line wide, scabrid; lowest bractlet $4\frac{1}{2}$ lines long, scabrid; awn scabrid, $1\frac{1}{2}$ lines long; palea $3\frac{1}{2}$ to 4 lines long; anthers 1 line long; scales less than $\frac{1}{2}$ line long.

Pt. Reyes, in a swale facing the ocean. July.

5. *E. glaucus* Buckl. GLAUCOUS WILD-RYE. Erect perennial; rootstock stoloniferous; stems tufted, erect from a more or less arcuate base, $2\frac{1}{2}$ to 3 ft. high, smooth; branches 2 to 3 from the base of each stem; sheaths smooth or minutely scabrid; ligule regularly truncate, entire, less than $\frac{1}{2}$ line long; blade flat, narrower than the sheath, auricled at the base, scabrid on both surfaces or the lower glabrous, $2\frac{1}{2}$ to 5 or rarely in very luxuriant specimens $7\frac{1}{2}$ lines wide, acute; uppermost $2\frac{1}{2}$ to 4 in. long, lowest about 8 in. long; spike linear, erect, $2\frac{1}{2}$ to 5 or rarely 7 in. long, $2\frac{1}{2}$ to 4 lines wide; rachis scabrid on the margins; spikelets in pairs, rarely threes, appressed, 4 to 6

lines long excluding awns, 3 to 4-flowered; bracts lanceolate, 4 to 6 lines long, acuminate or awn-pointed, with 2 to 4 prominent scabrid nerves; bractlets scabrid above, 5-nerved, lowest $4\frac{1}{2}$ to 6 lines long, tapering into a straight, erect, scabrid awn $3\frac{1}{2}$ to 7 lines long; palea $4\frac{1}{2}$ to 5 lines long, scabrid, slightly emarginate; scales $\frac{1}{2}$ to 1 line long, lanceolate, acute, toothed on one side or the margins regularly curved, sparingly ciliate; anthers nearly $1\frac{1}{2}$ lines long, purplish; achene $2\frac{1}{2}$ to 3 lines long.

Thickets on open hillsides along the coast, common within our limits: San Francisco; Pt. Reyes; Berkeley. June-July. Var. *BREVIARISTATUS* Davy. Bracts 6 to 9 lines long; awn of the bractlet 0 to 3 lines long.—Pt. Reyes; Bodega Pt. June-July. Var. *JEPSONII* Davy. Lowest leaves retrorsely pubescent. Napa Valley. Var. *TENUIS* Vasey, is much more slender in every way; spikes $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide.—Sacramento Valley. May. Var. *MAXIMUS* Davy. Tall and stout; leaf-blades $5\frac{1}{2}$ to $8\frac{1}{2}$ lines wide, sometimes glabrous in age; spike 7 in. long, 4 lines wide, slightly drooping above; spikelets mostly 6-flowered; bracts 7 to 9 lines long, often 5-nerved; awn of the bractlet very variable, 4 to 12 lines long.—Napa Valley; Bodega Pt.

6. *E. hispidulus* Davy. *HISPID WILD-RYE*. Rootstock stoloniferous; stem erect from a more or less arcuate base, about 3 ft. high, rooting and branching from the lowest nodes; lowest sheaths scabrid, uppermost retrorsely hispidulous; ligule of uppermost leaves entire, rounded, about 1 line long; blades narrower than the sheath, auricled at the base, scabrid on both surfaces and sparsely pubescent below, $1\frac{1}{2}$ to 4 lines wide, 6 to 7 in. long; spike $4\frac{1}{2}$ in. long excluding awns, 5 lines wide; spikelets in pairs, ascending, not closely appressed, 4 to 6-flowered, the longest 10 lines long excluding awns; lowest internode of the rachilla about 1 line long, pubescent; bracts $5\frac{1}{2}$ lines long, lanceolate-subulate, awn-pointed, 3-nerved, scabrous; lowest bractlet 7 lines long with an awn its own length, hispidulous above, 5-nerved, palea $\frac{1}{2}$ line shorter, pubescent and emarginate above, scabrid on the keels; scales $\frac{3}{4}$ to 1 line long, pubescent and ciliate, unevenly lobed near the base on one side only; anthers $1\frac{1}{2}$ lines long.

Olema, Marin Co. Near to *E. glaucus* var. *jepsonii*, differing in the longer and rounded ligule, the hispidulous clothing to the sheaths which is less abundant on the lowest than on those above, and the hispidulous bractlets.

7. *E. divergens* Davy. *DIVERGENT WILD-RYE*. Perennial; rootstock short, very stout and woody, not stoloniferous; stems stout, erect, 2 to $2\frac{1}{2}$ ft. high; sheaths densely, or the uppermost sparsely, antrorsely pubescent; ligule $\frac{1}{2}$ line long, regularly truncate; blades flat or becoming involute, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines wide, pubescent on both surfaces or the uppermost glabrous on the lower surface; those of the lowest cauline leaves about 12 in. long, those of the uppermost $2\frac{1}{2}$ to 4 in. long; peduncle glabrous; spike 4 to 6 in. long, slender; rachis slender, continuous; spikelets in pairs, sessile, few-flowered; bracts broad, acuminate-pointed, $\frac{1}{2}$ in. long, and $\frac{1}{2}$ line wide at the middle, channeled; bractlet 5 lines long, excluding its awn, scabrid; awn 6 to 12 lines long, scabrous, hygroscopic, very divergent when dry, straight and erect when moist; palea 4 to 5 lines long, truncate, scabrous on the margins; achene 3 lines long.

Petaluma; dry bushy hillsides, Pt. Reyes.

8. *E. angustifolius* Davy. *NARROW-LEAVED WILD-RYE*. Slender, erect perennial, forming low, leafy tufts; rootstock apparently not stoloniferous; stems erect from a more or less arcuate base, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, smooth, rooting and branching freely at the lowest nodes; uppermost sheaths glabrous, lowest

and those of the branches densely retrorsely scabrous and ciliate on the margins, or glabrous; ligule regularly or somewhat obliquely truncate, $\frac{1}{4}$ line long; blades flat, or involute when dry, $1\frac{1}{2}$ or rarely $2\frac{1}{2}$ lines wide, sparingly pubescent and scabrid on the upper surface, antrorsely scabrid on the lower, much narrower at the base than the sheath and strongly auricled; lowest cauline blades 7 to 8 in. long, uppermost about 4 in. long; spike lanceolate-linear, $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long, 3 to 5 lines wide; rachis scabrous on the margins; spikelets in pairs, ascending or appressed, $4\frac{1}{2}$ to 7 lines long excluding awns, and slightly exceeding the internodes, 3 to 4-flowered, uppermost flower imperfect or sterile; bracts narrow-lanceolate to linear, acute, $4\frac{1}{2}$ to 5 lines long, 3 to 4-nerved and ribbed, scabrid on the nerves; bractlet 4 to $5\frac{1}{2}$ lines long excluding the awn, 5-nerved, scabrid; awn erect or somewhat spreading, $1\frac{1}{2}$ to 4 lines long, strongly scabrid; palea 4 to $4\frac{1}{2}$ lines long, slightly emarginate, ciliate, scabrous on the keels; stamens 3; scales 2, $\frac{3}{4}$ line long, oblique or truncate notched or lobed on one side near the base, obtuse; anthers $1\frac{1}{4}$ lines long; ovary clavate; stigmas 1 line long, plumose.—(*E. sibiricus* Thurb., in Bot. Cal. in part, not of L.)

Common on dry hillsides in the Coast Ranges: San Francisco; Berkeley. Apr.-June. Near to *E. glaucus* var. *tenuis* Vasey, but distinguishable by its more tufty and leafy habit, by the usually narrower leaf-blades and by the shorter and relatively stouter spikes. Var. *CAESPITOSUS* Davy. Tufted Wild-rye. Densely tufted perennial; rootstock not stoloniferous; stems slender, erect, densely clothed below with dead sheaths, 8 to 14 in. high; branches very numerous from the base, the longest about 6 in. long; all the sheaths glabrous throughout, the lowest minutely punctate, prominently striate; ligule reduced to a narrow truncate ring; blades short, flat, or becoming somewhat involute when dry, 1 line wide at the base, glabrous except on the scabrid margins; uppermost cauline 1 to $1\frac{1}{2}$ in. long, lowest cauline $4\frac{1}{2}$ in. long; peduncle glabrous, spike well exerted, 2 to $2\frac{1}{2}$ in. long, narrow; spikelets in pairs, sometimes one of them rudimentary, 2-flowered; bracts acute, $3\frac{1}{2}$ lines long, $\frac{1}{2}$ line wide, glabrous; bractlet $3\frac{1}{2}$ lines long, terminating in an erect, minutely scabrid awn $2\frac{1}{2}$ to 4 lines long; palea about equaling it in length; achene $2\frac{1}{4}$ lines long.—Berkeley Hills.

9. *E. sitanion* R. & S. Stems 1 to 2 ft. high; sheaths smooth, spikes 4 to 7 in. long including the long awns, jointed at the nodes of the rachis and readily breaking up at maturity; spikelets mostly in pairs; bracts mostly 2-parted to the base, rarely entire, the divisions again unequally 2-cleft, passing insensibly into awns 1 to 3 in. long.—(*Sitanion elymoides* Raf.)

A very variable grass, often resembling and sometimes mistaken for *Hordeum jubatum*, but readily distinguishable by its divided bracts.

45. *ASPERELLA* Humb. BOTTLE-BRUSH-GRASS.

Leaf-blades broad, flat. Spike racemose, the spikelets resembling short, fascicled branchlets owing to the exposure of the base of the rachilla by the suppression of the bracts; spike at first cylindrical, in aestivation loose. Spikelets 1 to 5 at each node of the more or less flattened and notched rachis, 1 to 4-flowered. Bracts reduced to scars, or small, deciduous spines. Rachilla jointed below each bractlet, terminating in a perfect or staminate flower. Bractlet coriaceous, rounded on the back, 5-nerved above, terminating in a long, stout awn. Palea 2-keeled. Scales 2, large, distinct, shortly and unequally toothed above, acute, ciliate. Stamens 3; anthers large. Ovary hairy, espec-

ally above; stigmas 2 lines long, sessile or nearly so, remote, feathery. Achene hairy at the apex. (Diminutive of Latin *asper*, rough, prickly, referring to the rough, long-awned spike of some species.)

1. **A. californica** (Boland.) Beal. CALIFORNIA BOTTLE-BRUSH. Rootstock perennial, stout, creeping; stems stout, leafy, sub-solitary, erect from a decumbent base, $3\frac{1}{2}$ to 6 ft. high; sheaths split to the base, loose, scabrous, those below usually clothed with short, stiff, spreading or reflexed hairs; ligule about 1 line long, obtuse, crose, brown; blade 4 to 14 in. long, $\frac{1}{2}$ to 1 in. wide, flat, antrorsely scabrous, especially beneath, shining with a satiny luster; spike 5 to 10 in. long, dense and drooping above, interrupted below, purplish; rachis with scabrous margins; spikelets $\frac{1}{2}$ to $\frac{3}{4}$ in. long, 1 to 3-flowered; rachilla with a prominent callus below each bractlet; bractlet 6 to 7 lines long, 5-nerved, the nerves, especially the marginal ones, ciliate-hispid with short, stiff, rather distant, white hairs; awn stout, straight, rough, about 10 lines long; palea membranaceous, prominently keeled, ciliate above; scales $1\frac{1}{4}$ lines long, ciliate fringed; anthers 3 lines long, yellow.—(*Gymnostichum californicum* Boland.; *Asprella californica* Benth.)

Apparently confined to moist woodlands and thickets in the Redwood belt immediately north and south of San Francisco. Apr.-July. In the young state the plant closely resembles an *Elymus*, and entirely lacks the "bottle-brush" aspect of its mature state; it can be distinguished, however, by the short, pedicel-like rachilla-base of the spikelets, and the absence of bracts.

46. HORDEUM L. BARLEY-GRASS.

Leaf-blades flat. Inflorescence a dense spike, jointed at the nodes and breaking up at maturity, the spikelets remaining attached to the hard, sharp, callus-like internode. Spikelets 1-flowered, in threes at each joint of the rachis; the central sessile, perfect; the lateral, in ours, pedicellate and usually sterile. Bracts often reduced to awns and resembling an involucre around the spikelets, rigid. Rachilla prolonged beyond the flower as a bristle. Bractlets chartaceous in age, rounded on the back, 5-nerved at the apex, that of the perfect spikelet, and sometimes all, awned. Palea scarcely shorter than its bractlet, 2-keeled. Stamens 3. Styles very short, distinct. Achene hairy at the summit. (The Latin name for Barley, the typical plant of the genus.)

Perennial; spike slender; awns appressed; bracts of all the spikelets bristle-like; bractlets of the central spikelet 3 to 4 lines long.....1. *H. nodosum*.

Annuals; spike stout, broad; awns rigid, erect or spreading; bracts not all bristle-like.

Bracts of the central spikelet strongly pectinate-ciliate; spike 2 to 4 in. long.....

2. *H. murinum*.

Bracts of the central spikelet not pectinate-ciliate; spike 1 to 2 in. long.....

3. *H. maritimum*.

1. **H. nodosum** L. MEADOW BARLEY-GRASS. Erect perennial; stems $\frac{1}{2}$ to 3 ft. high; sheaths glabrous, often glaucous; ligule truncate, $\frac{1}{4}$ to $\frac{1}{2}$ line long; blades $2\frac{1}{2}$ to 4 lines wide, often deflexed, flat, scabrous, or scabrid above only; spike $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long, slender, 4 to 5 lines wide, compressed, usually nodding; awns appressed, brown, tinting the whole spike; rachis very brittle; lateral spikelets awnless, staminate or rudimentary, $2\frac{1}{2}$ lines long, or reduced to an empty bractlet; bracts all awnlike, scabrous; bractlet of central spikelet awned, 7 to 9 lines long including the awn; scales 2, ovate, obtuse, hyaline, ciliate above, $\frac{1}{2}$ line long; anthers yellow, $\frac{1}{2}$ line long.—(*H. pratense* Huds.)

Common by roadsides, in waste places and borders of fields, often occurring

in alkali soils: Alameda, Contra Costa, San Francisco, Marin and Santa Cruz cos. Mar.-May.

2. *H. murinum* L. BARLEY-GRASS. Annual; stems 6 to 24 in. high, decumbent at base, or in moist, shady places erect; upper sheaths glabrous, light green, scariosus-margined, often inflated; lower pilose; ligule $\frac{1}{2}$ to $\frac{3}{4}$ line long, truncate; blade both softly pubescent and scabrous, 1 to $5\frac{1}{2}$ lines wide; spikes 2 to 4 in. long, broad, stout, compressed; awns erect; spikelets densely imbricate; bracts awned; those of the central spikelet lanceolate, flat, 3-nerved, ciliate, with awns 9 to 12 lines long; those of the lateral spikelet similar, excepting the inner which are awn-like and not ciliate; bractlet scabrous at the apex, about 6 lines long, its awn $\frac{2}{3}$ to 2 in. long; bractlets of the lateral spikelets somewhat smaller, awn $\frac{1}{2}$ to 2 in. long; palea emarginate, somewhat webby within, keels distantly ciliate; scales of the sterile spikelets very prominent, $1\frac{1}{2}$ lines long; anthers broad, $\frac{1}{2}$ line long, green.

Native of Europe; naturalized and now very common throughout middle and southern California, and spreading northward. Apr.-May. Often mis-called Fox-tail.

3. *H. maritimum* With. var. *gussonianum* Husn. GUSSONI'S BARLEY-GRASS. Slender annual, 4 to 12 in. high; spike 1 to $1\frac{1}{2}$ in. long, excluding the awns; lateral spikelets reduced to rudiments; flower of central spikelet sessile; bracts of the central spikelet setaceous, the inner one of the lateral spikelets slightly flattened, $\frac{1}{4}$ line wide, not at all ciliate.

Naturalized from S. Europe and now very common throughout the State: Berkeley; Olema; Bodega Pt., and elsewhere. Apr.-May.

CYPERACEAE. SEDGE FAMILY.

Annual or perennial herbs of marshy or damp places. Stems solid, arising from rootstocks, triangular or terete, the upper internode below the inflorescence generally very long. Leaves often arranged in 3 rows, sheathing at base, the sheath closed, seldom split; ligule none or very small. Flowers in spikelets, solitary and sessile in the axils or imbricated glume-like bractlets, and disposed in 2 or more ranks; spikelets solitary or clustered, or arranged in spikes, racemes, panicles or umbels, and subtended by leafy bracts, or naked. Perianth none or represented by usually 4 to 6 bristles. Stamens 3. Pistil 1; ovary 1-celled, the single style 2 or 3-cleft. Fruit a lenticular or more or less triangular achene. (The specific keys and descriptions in this family have been done by Mr. J. Burt Davy.)

Flowers perfect (the stamens and pistils in the axil of the same bractlet).

Spikelets flattened, the bractlets arranged in 2 opposite rows.....1. CYPERUS.

Spikelets cylindrical, the bractlets arranged around the axis in several rows.

Style enlarged at base,

Forming a persistent tubercle jointed on the apex of the achene; spikelet solitary, terminal upon a leafless bractless scape.....2. ELEOCHARIS.

Wholly deciduous at maturity; spikelets in an involucre umbel...3. FIMBRISTYLIS.

Style not enlarged at base, deciduous or only the base persistent.

Stamens mostly 3; spikelets solitary or clustered or in a compound umbel.....

4. SCIRPUS.

Stamens 1 to 3; bristles (perianth-hairs) numerous, long exserted and silky in fruit.....5. ERIOPHORUM.

Flowers monoecious or dioecious, usually in separate spikelets; pistil and achene enclosed in an inflated sac-like bractlet (perigynium).....6. CAREX.

1. CYPERUS L. GALINGALE.

Annuals or perennials. Stems triangular, leafy at the base, the inflorescence subtended by 1 or more conspicuous, leafy bracts. Spikelets solitary or

clustered on the unequal rays of an umbel with the central spikelet or cluster always sessile, or the whole contracted into a dense head. Bractlets concave and more or less earinate, arranged in 2 ranks in a flattened spikelet. Bristles in the flower none. (Kuperos, an old Greek name applied by Herodotus to an aromatic plant used by the Seythians for embalming.)

Style 2-cleft; achene lenticular; rachilla narrow, not winged.....1. *C. diandrus*.
Style 3-cleft; achene triangular.

Rachilla not winged, naked or nearly so.

Stems $\frac{1}{2}$ to 6 in. high.....2. *C. aristatus*.

Stems over 12 in. high.....3. *C. serrulatus*.

Rachilla clothed with the persistent, decurrent wings of the bractlets...4. *C. erythrorhizos*.

1. *C. diandrus* Torr. var. *castaneus* Torr. Described as an annual with stems $\frac{1}{2}$ to 2 ft. high, slender, triangular; leaves elongate, 1 line or less wide; involueral bracts 2 to 3, foliaceous; spikelets linear-oblong, acute, 3 to 6 lines long; rachilla not winged; bractlets brown, 1 to $1\frac{1}{4}$ lines long; stamens 2 to 3; style 2-cleft to the middle; achene lenticular.

Swamps near San Francisco, Bolander, and in the valley of the Sacramento, Pickering.

2. *C. aristatus* Rottb. Annual; stems $\frac{1}{2}$ to 6 in. high, barely exceeding the leaves; leaves $\frac{1}{2}$ line or less wide; involueral bracts foliaceous, $\frac{1}{2}$ to 2 in. long; rays few, $\frac{1}{2}$ to 1 in. long; spikelets sessile, densely clustered, $1\frac{1}{2}$ to 3 lines long, flattened; rachilla not winged; bractlets with strongly recurved setaceous tips, striate, chestnut-brown or greenish, 1 line long; style 3-cleft; achene triangular.

Chico; Jackson; perhaps not occurring within our limits. June.

3. *C. serrulatus* Wats. Perennial (?); stems $1\frac{1}{2}$ ft. or more high, stout, triangular; involueral bracts 6 to 8, foliaceous, 3 to 18 in. long, 2 to $3\frac{1}{2}$ lines wide, flat (or conduplicate?); inflorescence irregularly umbellate, with unequal rays; spikelets numerous, in dense umbels, many-flowered, lanceolate, flattened, 4 to 8 lines long; rachilla not winged, naked, or nearly so; bractlet 1 line long, amplexicaul, broadly ovate, acute, 3-nerved, keeled, not winged at the base; keel serrulate on the back at the apex; stamen 1; style 3-cleft; achene triangular.

Healdsburg, Miss Alice King.

4. *C. erythrorhizos* Muhl. Annual; stems 1 to $1\frac{1}{2}$ ft. high, stout, triangular; leaves flat or conduplicate, 6 to 14 in. long, 2 to 3 lines wide; involueral bracts 6 to 8, foliaceous, 4 to 12 in. long; rays $1\frac{1}{2}$ in. long or less, bearing umbels of spikes which are $\frac{1}{2}$ to 1 in. long; bracts of involuells shorter, foliaceous; spikelets usually 2 to 3 lines long, narrowly linear, somewhat crowded, horizontally spreading, nearly flat, bright chestnut-color; rachilla clothed with the persistent wings of the bractlets; bractlets $1\frac{1}{2}$ lines long, oblong, obtuse, mucronulate; keel smooth; style 3-cleft; achene triangular.

Lower Sacramento; Visalia.

2. ELEOCHARIS R. Br. SPIKE-RUSH.

Annuals or perennials. Stems simple, terminating in a solitary spikelet not subtended by an involucre. Leaves reduced to sheaths or the lowest rarely blade-bearing; spikelets several to many-flowered. Bractlets concave, imbricated all around. Stamens 2 to 3. Bristles 3 to 9, commonly retrorsely barbed. Style usually 3-cleft and achene 3-angled, or 2-cleft and achene lenticular; base of the style enlarged and persistent as a tubercle on the summit of the achene. (Greek eleo, marsh, charis, delight.)

Stems setaceous; spikelet 1 to 3 lines long; style 3-cleft; achene obscurely triangular or almost obovoid 1. *E. acicularis*.
 Stems stoutish; spikelet 3 to 12 lines long; style 2-cleft; achene plano-convex. 2. *E. palustris*.

1. *E. acicularis* R. Br. SLENDER SPIKE-RUSH. Rootstock very slender, creeping; stems 1 to 8 in. high, very slender; spikelet 1 to 3 lines long, few-flowered; bractlets ovate-oblong, $1\frac{1}{2}$ lines long, reddish brown with broad green mid-vein; style deeply 3-cleft; achene $\frac{1}{2}$ line long, obscurely triangular, ribbed on the sides; tubercle broad, short and blunt.

Moist places: San Francisco. Aug.

2. *E. palustris* R. Br. COMMON SPIKE-RUSH. Perennial; rootstock stout, creeping, stoloniferous; stems $\frac{1}{2}$ to 2 ft. high, slender, mostly terete, sheathed at the base, leafless; sheaths sub-truncate; spikelet many-flowered, 6 to 12 lines long, oblong-lanceolate to linear, brown with broad whitish margin and greenish keel; style 2-cleft; achene plano-convex, rounded but not at all angled on the back, 1 line long including the tubercle, which is constricted at the point of junction.

Common in marshes and shallow, slow-moving creeks: Glen Ellen; San Francisco; Lake San Andreas; Stege. May-June.

3. FIMBRISTYLIS Vahl.

Annuals or perennials. Stems leafy below. Spikelets umbellate or capitate, terete, subtended by a 1 to many-leaved involucre. Stamens 1 to 3. Bristles none. Style 2 to 3-cleft its base much swollen, the whole falling away from the achene at maturity. Achene lenticular or triangular. (Latin fimbri, thread-like, stylus, style.)

Spikelets umbellate, solitary 1. *F. miliacea*.
 Spikelets clustered. 2. *F. apus*.

1. *F. miliacea* Vahl. Annual (?); umbel diffusely compound; spikelets sub-globose, about 1 line long; style 3-cleft; achene acutely triangular, muciccate-tuberculate.

Reported as introduced at San Francisco.

2. *F. apus* (Gray) Wats. Annual; spikelets in nearly sessile clusters, lanceolate, 2 lines long; style 2-cleft; achene lenticular, obovate, faintly tuberculate.

Clear Lake, Bolander.

4. SCIRPUS L. CLUB-RUSH. BULRUSH.

Annuals or perennials. Stems leafy or the leaves reduced to mere sheaths at base. Spikelets terete or somewhat flattened, solitary or in heads, spikes or umbels, subtended by an involucre or 1 to several leaves or the involucre obsolete. Bristles 3 to 6, barbed, ciliate, or obsolete. Stamens 2 to 3. Style 2 to 3-cleft, not swollen at the base, deciduous or its base persistent on the achene. Achene triangular, lenticular or obovoid. (Latin scirpus, bulrush.)

Stems low and slender; inflorescence terminal; spikelet mostly solitary; bristles obsolete.—Sub-genus *SOLEPIS* Benth.

Stems 2 to 6 in. high; bractlets obtuse or mucronate; involucreal bract 1 to 3 lines long..

1. *S. riparius*.

Stems 1 to 3 in. high; bractlets acute, shortly beaked, strongly keeled; involucreal bract 5 to 9 lines long. 2. *S. carinatus*.

Stems tall and stout; spikelets in clusters, umbels or panicles; bristles retrorsely barbed or ciliate or rarely obsolete.—Sub-genus *EUSCIRPUS* Benth.

Inflorescence apparently lateral; involucre of a single erect bract.

Stem terete or nearly so, leafless or nearly so; spikelets umbellate. 3. *S. lacustris*.

- Stem triquetrous or wing-angled, leafless or with a single short leaf at base; involueral bract 1 in. or less long; spikelets densely clustered.....4. *S. olneyi*.
 Stem triangular, somewhat leafy; involueral bract 1 to 4 in. long; spikelets densely clustered5. *S. americanus*.
 Inflorescence terminal; involuere of several spreading, foliaceous bracts.
 Spikelets 5 to 8 lines long, few, sparingly umbellate or in a sessile cluster, dark brown6. *S. robustus*.
 Spikelets $1\frac{1}{2}$ to 2 lines long, numerous, in a compound or decompound panicle, greenish or lead-colored7. *S. microcarpus*.

1. ***S. riparius* Spreng.** SLENDER CLUB-RUSH. Annual; stems tufted, very slender, 2 to 6 in. high, sheathed at base; upper sheath often bearing a short slender leaf; involueral bract 1 to 3 lines long; spikelet solitary, oblong-ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, most less than 1 line wide; bractlets obtuse or mucronate; bristles obsolete; achene less than $\frac{1}{2}$ line long, trigonous-obovoid with distinct angles, apiculate, not striate nor ribbed, dark brown when mature.

Not uncommon in springy places: San Francisco; Olema. June-Aug.

2. ***S. carinatus* Gray.** DWARF CLUB-RUSH. Annual; stems slender, triangular, 1 to 4 in. high, with a short leaf at base; involueral bract 5 to 6 lines long; spikelet solitary, ovate, 2 to 3 lines long, mostly $1\frac{1}{2}$ lines wide; bractlet acute, shortly beaked, strongly keeled; bristles obsolete.

About San Francisco, *Bolander*; Santa Rosa Creek, *Bigelow*.

3. ***S. lacustris* L. var. *occidentalis* Wats.** TULE. Perennial; rootstock stout, creeping; stems 3 to 9 ft. high, terete or very obtusely trigonous above, leafless or with a short terete leaf from the upper basal sheath; inflorescence apparently lateral, umbellate, 4 to 5 in. long; involueral bract stout, shorter than the inflorescence; spikelets 3 lines long, numerous, in an irregularly compressed umbel; rays unequal; bristles 4 to 6, slender, retrosely barbellate, not exserted; style 2-fid; achene gray, abruptly mucronate.

Common in brackish and fresh-water marshes throughout the State: Lake Merced; Martinez; Suisun Marshes, etc. The closely allied species *S. californicus* (C. A. Mey.) Britt., (*S. tatora* Kunth), having the bristles shortly plumose below and with a nearly white achene, narrowed above, should be looked for.

4. ***S. olneyi* Gray.** OLNEY'S BULRUSH. Perennial; stems 2 to 5 ft. high or more, stout, triquetrous, continued as an entire involuere about 1 in. or less beyond the inflorescence, sheathed at base, leafless or with a single short, triquetrous leaf; inflorescence apparently lateral; spikelets 2 to many in a crowded sessile cluster, oblong-ovate, about 2 lines long; bractlets brown.

Common in brackish marshes from Suisun Bay southward to Newark. May.

5. ***S. americanus* Pers.** THREE SQUARE. Perennial; stems 1 to 2 ft. high, slender, triangular, somewhat leafy, continued as an entire, triangular, pungent involuere 1 to 4 in. beyond the inflorescence; leaves short; inflorescence apparently lateral; spikelets 1 to 6, in a crowded, sessile cluster, oblong-ovate, 3 to 4 lines long; bractlets dark brown, usually conspicuously tipped with a stout, pale-colored awn about a line long.—(*S. pungens* Vahl.)

Marshy places, often brackish: San Francisco, southward and eastward.

6. ***S. robustus* Pursh.** SALT-MARSH BULRUSH. Perennial; rootstock stout, often forming hard woody tubers; stems 1 to 3 ft. high, stout, trigonous; leaves equaling or exceeding the stem, keeled, flat or deeply channeled, 2 to 4 lines wide, antrorsely scabrid on the margins and keel; involuere of several unequal spreading foliaceous bracts 1 to 8 in. long, one much the longer and more erect; inflorescence terminal, of few to many sparingly umbellate spikelets; spikelets oblong-ovate, acute, 6 to 8 lines long, 4 to 5 lines broad at base,

chestnut-colored or dark brown; bractlets thinly scarious, strongly keeled, bifid, with a short soon recurved awn from between the teeth; achene broadly obovate, plano-convex or with a low ridge on the back, obtuse and slightly apiculate, dark brown, shining.—(*S. maritimus* of Bot. Cal.)

Common in brackish marshes along the coast, and in moist alkaline soils in the interior: Newark; Suisun Marshes. Fl. May. Fr. Sept. Var. *compactus* Davy has the spikelets congested into dense heads.—Stege.

7. *S. microcarpus* Presl. PANICLED BULRUSH. Perennial; rootstock stout, creeping; stem 2 to 3 ft. high, stout, leafy, triangular; leaves flat, 6 to 12 lines wide; margins scabrid; involucre of several sub-equal spreading foliaceous bracts, about equaling the inflorescence; panicle decompound, large and open; rays 1 to 6 in. long, the spikelets in terminal and axillary clusters; spikelets $1\frac{1}{2}$ to 2 lines long, oblong-ovate, greenish or lead-colored; bristles 4, barbed to the base; stamens 2; style bifid; achene $\frac{1}{2}$ line long, pale, plano-convex, not angled on the back, abruptly short-beaked.—(*S. sylvaticus* L. var. *digynus* of Bot. Cal.)

Common along streams and in fresh-water marshes: Berkeley; San Francisco; San Mateo Co.; Mt. Tamalpais; Guerneville. May-Oct.

5. *ERIOPHORUM* L. COTTON-SEGE.

Bog perennials. Stems from creeping rootstocks, triangular or subterete, leafy or naked. Leaves linear or the uppermost reduced to sheaths. Spikelets terminal on the stem, solitary or clustered or umbellate, subtended by an involucre of scale-like bracts or none. Bractlets of the spikelet membranaceous. Bristles numerous, filiform, silky, becoming greatly elongated in fruit. Stamens 1 to 3. Style very slender and elongated, 3-cleft. Achene triangular. (Greek *erion*, wool, *phora*, crop, referring to the woolly heads.)

1. *E. gracile* Koch. SLENDER COTTON-SEGE. Described by Watson as having stems 1 to 2 ft. high, very slender, with one or more erect, very narrow, triangular leaves; involucre of 2 to 3 erect, brownish, ovate-lanceolate bracts, the lowest being sometimes partially foliaceous; rays $\frac{1}{2}$ in. or less long, slightly nodding, tomentose-scarious; spikelets 2 to 5, oblong, 3 to 4 lines long; bractlets ovate, obtuse, slate-colored or brownish; achene $1\frac{1}{3}$ lines long, linear-oblong, broadest above.

Reported as occurring in "swamps near Santa Rosa," *Bigelow*.

6. *CAREX* L. SEGE.

Perennial. Stems from rootstocks, triangular and commonly more or less scarious on the angles, the leaves in 3 ranks. Spikelets terminal and solitary, or with several below the terminal one in the axils or leafy or scale-like bracts, either wholly pistillate and wholly staminate or with both pistillate and staminate flowers which are occasionally dioecious. Flowers in the axils of scale-like bractlets. Staminate flower of 3 stamens. Pistillate flower consisting of a single pistil; ovary enclosed in an inflated bract or sac (perigynium) contracted at the top through which project the 2 or 3 stigmas. Achene triangular, lenticular or plano-convex, completely enclosed in the perigynium. (Latin name used by Virgil for the sedge. The key to our species of this difficult genus has been adapted from L. H. Bailey's "Preliminary Synopsis of North American Carices." For the briefly described vegetative characters we have drawn largely from Boott's account of the Californian species.)

Spikelets unisexual or rarely androgynous; staminate flowers forming 1 or more terminal linear or club-shaped spikelets, which are occasionally sparingly androgynous; pistillate flowers usually in distinct and simple mostly pedicellate spikelets; cross-section of the perigynium circular, obtusely angled or prominently trigonous in outline; style mostly 3-parted; achene mostly trigonous or triquetrous.—Sub-genus *EU-CAREX* Coss.

Perigynium large, tapering into a beak as long as or longer than the body, papery in texture, more or less inflated, smooth, nerved, straw-colored or occasionally purple at maturity; spikelets few to many, distinct, compactly flowered; stigmas 3.

Perigynium much inflated, usually prominently few-nerved, beaked, conspicuously short-toothed; staminate spikelets commonly 2 or more; pistillate usually long and densely cylindrical; plants mostly large and stout.....1. *C. vesicaria*.

Perigynium less inflated, more conspicuously nerved or even costate; teeth more or less setaceous or aristate; bractlet usually aristate; spikelets mostly nodding, comose in appearance.....2. *C. pseudocyperus*.

Perigynium small, nearly or entirely beakless and mostly entire mouthed, thinner in texture; mostly paludose species with colored spikelets; often growing in dense tufts or tussocks.

Spikelets short and erect, very closely flowered, the terminal strictly staminate; bracts with purple or black auricles at base; stigmas 2 or 3; mostly stiff and rigid species.

Stigmas 33. *C. biida*.

Stigmas 24. *C. nudata*.

Spikelets long and large, green or light-colored; stigmas 2; species larger, distinguished mainly by habit; mostly paludose.

Stems clothed with dead sheaths below; spikelets mostly long pedicellate.....

5. *C. obnupta*.

Stems spongy at base; spikelets mostly sessile.....6. *C. aquatilis*.

Spikelets large, cernuous or drooping, mostly dark-colored; stigmas 2; bractlets very long and conspicuous; plants large.....7. *C. sitchensis*.

Perigynium mostly short and rounded; beak straight and usually 2-fid, firm or hard in texture, not inflated, hairy or scabrous; staminate spikelet 1; pistillate spikelets 1 in. or less long, usually globular or short-oblong, more or less sessile and approximate, or the longer ones radical; bracts sheathless, short or obsolete; stigmas rarely 2; low species of dry ground, with leaves all radical.

Spikelets 2 to several, the lowest occasionally long-pedicellate and radical; perigynium abruptly rounded above, contracted above and below, bearing a more or less prominent rib on each side.....8. *C. globosa*.

Spikelets androgynous (rarely dioecious or some of the spikelets unisexual); staminate flowers usually borne at the base or apex of the pistillate spikelets, rarely the staminate and pistillate flowers irregularly situated; pistillate flowers mostly in short and sessile spikelets (in some cases the spikelets single) which are commonly aggregated into heads or even panicles; cross-section of the perigynium plano-convex in outline; styles 2; achene lenticular; the spikelets, especially the uppermost, usually have contracted bases when the staminate flowers are borne below the pistillate ones, and empty scales at the top when the staminate flowers are borne above.—Sub-genus *VIGNEAE* Koch.

Flowers often dioecious or nearly so, or the staminate and pistillate flowers irregularly situated, or some of the spikelets occasionally wholly staminate or pistillate.

Inflorescence a simple or nearly simple head; perigynium ovate, stipitate, concealed by the bractlet, at length nearly black.....9. *C. marciada*.

Flowers monoecious; spikelets regularly androgynous, the staminate flowers uniformly borne at the top.

Spikelets yellow or tawny when mature, short, rarely longer than broad; perigynium mostly small and short and nearly nerveless, or in some species becoming nearly lanceolate and more or less prominently nerved, firm in texture.

Inflorescence a simple or nearly simple head.....10. *C. brongniartii*.

Spikelets green or nearly so when mature, aggregated or scattered, never in compound heads; perigynium mostly short-ovate, in most cases not conspicuously nerved.

Plants slender; spikelets more or less scattered.....11. *C. muricata*.

Flowers monoecious; spikelets regularly androgynous, the staminate flowers uniformly borne at the base.

Inflorescence silvery green or sometimes tawny when mature; spikelets mostly small, distinct; perigynium not wing-margined nor conspicuously broadened, mostly nearly flat on the inner surface.

Perigynium ovate, sharp-margined, firm, often thickened at the base, spreading, in open, and at maturity stellate, spikelets.....12. *C. echinata*.

Perigynium ovate-lanceolate or nearly linear, mostly in loose spikelets.....13. *C. deweyana*.

Inflorescence tawny or dark; spikelets rather large, sometimes crowded; perigynium with a more or less thin or winged margin, which is incurved at maturity, rendering the perigynium concave on the inner surface.

Perigynium ovate or ovate-orbicular, thickened in the middle.....14. *C. festiva*.

1. *C. vesicaria* L. Rootstock creeping; stems 1 to 3½ ft. high, sharply angled, scabrous; leaves 2 to 3 lines wide, the upper exceeding the stem; bracts exceeding the stem; perigynium conspicuously turgid, ovoid or conical, ascending at maturity, smooth, shining.

Tomaes Bay.

2. *C. pseudo-cyperus* L. var. *comosa* Boott. Stems 1½ to 2½ ft. high, stout, sharply angled; leaves rigid, tapering to a long slender triangular apex, 2½ to 5 lines wide; spikelets densely flowered, uppermost staminate; perigynia retrorsely spreading in fruit; beak very long, deeply bifid.

Swamps near San Francisco; marshy flats near Guerneville.

3. *C. bifida* Boott. Stems 2 to 3 ft. high, slender, acutely angled; leaves 1 to 2 lines wide, pale, mostly shorter than the stem; lower sheaths reddish, sparingly reticulate-fibrous; spikelets 4 to 9 lines long, 3 lines wide, densely flowered, purple and glaucous, the terminal rarely bearing a few pistillate flowers above; perigynium shortly beaked.

Salinas Valley; Pacheco Pass.

4. *C. nudata* Boott. Stems sharply angled, scabrous, 12 to 16 in. high, slender, clothed at base with conspicuous dark brown leafless reticulate-fibrous sheaths; leaves 1 to 2½ lines wide, setaceously pointed, shorter than the stem; bracts without sheaths, lowest rarely equaling the stem; auricles purple, oblong; perigynium purple above, straw-colored below, deciduous.

Coast Ranges from San Francisco to Ukiah. Apr.

5. *C. obnupta* Bailey. Rootstock creeping, stoloniferous; stems 2 to 4 ft. high, forming large, dense clumps, clothed with dead sheaths below; leaves almost equaling the stems, 2 to 3 lines wide; margins scabrous; bracts much exceeding the stem.

Common in moist cañons and on the borders of streams and swamps.

6. *C. aquatilis* Wahl. Rootstock stoloniferous; stems 2 to 3 ft. high, stout, obtusely angled, smooth, spongy at base; leaves pale, 1½ to 3 lines wide, often exceeding the stem; bracts foliaceous, clasping, without sheaths, lower much exceeding the stem.

Santa Clara Valley.

7. *C. sitchensis* Presc. Stems 2 to 5 ft. high, stout, sharply angled, scabrous, many-leaved at base; lower sheaths reticulate-fibrous; leaves 3 to 4 lines wide, rigid, the cauline shorter, the radical longer than the stem; bracts without sheaths, foliaceous, the lower far exceeding the stem; auricles purple, clasping.

Salt-marshes about San Francisco Bay and northward along the coast.

8. *C. globosa* Boott. Rootstock stoloniferous; stems 4 to 16 in. high, very slender, scabrous, clothed at base with reddish-purple sheaths that break up into thread-like fibers; leaves firm, 1 to 2 lines wide, the lower longer than the stem; lower bracts short-sheathed, longer than their spikelets.

Coast Ranges among Redwoods: Oakland Hills (H. N. Bolander).

9. *C. marcida* Boott. Stems 1 to 2½ ft. high, slender, scabrous; leaves 1 line wide, shorter than the stem; flowers often more or less dioecious.

Lower Sacramento; Point Isabel. Apr.

10. *C. brongniartii* Kunth. Rootstock creeping; stems 10 to 30 in. high,

firm, slightly scabrous above; leaves shorter than the stem, 1 to 2½ lines wide; bracts setaceous, exceeding the spikelets, the lowest sometimes exceeding the stem.—(*C. glomerata* of Bot. Cal.)

San Francisco Bay to Mendocino City. Var. *DENSA* Bailey (*C. paniculata* of Bot. Cal.), described as “densely caespitose” and as having denser heads, mostly thickest at the base, often nearly an inch in width.—Salt-marshes near San Francisco, *Bolander*, no. 1568 in part, teste Bailey.

11. *C. muricata* L. var. *gracilis* Boott. Rootstock creeping, clothed with imbricated strongly nerved purple scales; stems ¾ to 2 ft. high, very slender, sharply angled, scabrous; leaves shorter than the stem, 1 line wide, tapering to a very slender, setaceous summit; bracts ovate, awned, commonly exceeding the spikelets, the lowest setaceous and often an inch or two long.

Near the coast from San Francisco Bay to Fort Bragg.

12. *C. echinata* Murr. Caespitose; stems ½ to 2 ft. high, few-leaved, stiff; leaves flat and grass-like, ½ to 1 line wide, much shorter than the stem; lower bract subulate from a lanceolate base, longer or shorter than its spikelet.

Swamps near Santa Rosa. Apr.-May.

13. *C. deweyana* Schwein. Caespitose; stems ½ to 4 ft. high, sharply angled, scabrous, slender, weak and often decumbent; leaves flaccid, 1 to 2 lines wide, shorter than the stem; lowest bract setaceous, seldom exceeding the stem, upper shorter or scale-like.

Shady hillsides, Napa Valley. Var. *BOLANDERI* Boott, with a slender stem and broader leaves is reported from Oakland (H. N. Bolander).

14. *C. festiva* Dewey. Caespitose; stems ½ to 2 ft. high, sharply angled, sometimes rooting; leaves 3 to 5, the upper the longest, commonly shorter than the stem, 2 to 2½ lines wide.

Coast Ranges, in grassy woods, from Monterey to Ukiah.

ARACEAE. ARUM FAMILY.

Perennial glabrous herbs with large leaves, perfect or usually unisexual flowers crowded on a spadix surrounded by a usually colored spathe. Ovary 1 to several-celled, ovules 1 to several in each cell.

1. *LYSICHTON* Schott.

Peduncle and radical leaves from a horizontal rootstock. Flowers perfect, the calyx 4-lobed with 4 stamens opposite the segments. Ovary 2-celled, 1 ovule in each cell; stigma depressed. Fruit a 2-seeded berry sunk in the spadix. (Greek *lusi*, loose, and *chiton*, a tunic or covering, referring to the spathe.)

1. *L. kamtschatcensis* Schott. Coarse herb with leaves 1 to 4 ft. long and ½ to 1½ ft. wide; peduncle stout, shorter than the leaves.

Swamps near the coast: Santa Cruz Mts. near Boulder Creek (Zoe. iv, 160); Russian River; Ft. Bragg; Humboldt Bay and northward to southeastern Alaska.

LEMNACEAE. DUCKWEED FAMILY.

Minute floating or submerged aquatic perennials, without leaves. Plant body consisting of a leaf-like stem or “frond” which is densely green, disk-shaped, elongated or irregular. Inflorescence a simple cluster of 2 staminate flowers and 1 pistillate flower, contained in a cleft or pouch on the margin

of the frond. Staminate flower consisting of a single stamen and the pistillate flower of a single ovary containing 1 to 7 ovules. Perianth none. Flowers and fruit scarce, in 1 species unknown. Vegetative reproduction active and taking place by lateral branching, the branches being attached by slender stalks (stipes). These branches soon separate or remain connected for some time; they may at certain seasons sink to the bottom of the pond or ditch and undergo a resting period. The account of genera and species here given has been adapted almost entirely from Chas. H. Thompson's Revision published in the 9th Report of the Missouri Botanical Garden.

Frond with 1 to several nerves and a single root; ovules 1 to 7.....1. LEMNA.
Frond without nerves; root none; ovule 1.....2. WOLFFIA.

1. LEMNA L. DUCKWEED.

Fronds disk-shaped, usually with a central nerve and with or without several lateral nerves, each with a single root which is commonly provided with a root cap. Reproductive pouches 2, appearing as clefts in either margin of the basal portion of the frond, each containing a cluster of 3 flowers surrounded by a spathe. Ovary with 1 to 7 ovules. Fruit ribbed. (Ancient Greek name.)

Frond with a long stipe, mostly submerged and forming large masses; papillae none....

3. *L. trisulca*.

Frond with a short stipe, floating on the surface.

Symmetrical or nearly so, papillate along the median line.

Oblong-ovate; fruit more or less lenticular.

Upper surface uniformly green; margin of the fruit without appendages; seed always 1.....2. *L. minor*.

Upper surface mottled with irregular brown streaks; margin of the fruit with rounded wing lobes; seeds 1 to several.....1. *L. gibba*.

Oblong to elliptical, small, green on both surfaces; with a row of papillae along the mid-nerve; fruit elongated.....5. *L. minima*.

Unsymmetrical,

Oblutely obovate; obscurely 3 to 7-nerved, papillate along the median line.

1. *L. gibba*.

Long oblong, thin, obscurely 1-nerved; papillae none.....4. *L. cyclostasa*.

1. **L. gibba** L. GIBBOUS DUCKWEED. Fronds 1 to 4 in a group, commonly 2, orbicular to obovate, slightly to very unsymmetrical, usually 3 to 5-nerved, 1 to 2 lines wide, 1 to 2½ lines long, thick, convex and slightly keeled above, flat to strongly gibbous beneath; base usually acute and commonly with narrow wing margins; pistil clavate; ovules 1 to 7; fruit symmetrical, purple-tinted, winged with rounded lobes at the upper margin on either side of the stigma.

Abundant in ponds.

2. **L. minor** L. SMALLER DUCKWEED. Fronds solitary or few in a cluster, round to elliptic-obovate, green or purplish beneath, uniformly bright-green above, convex on both sides, upper surface sometimes slightly keeled and with a row of papillae along the mid-nerve, the apical one usually quite prominent; pistil clavate; ovule 1; fruit not winged, projecting about ¼ beyond the margin of the frond.

Covering the surface of stagnant ponds. Variable.

3. **L. trisulca** L. IVY-LEAVED DUCKWEED. Fronds forming dense masses, oblong to oblong-lanceolate, slightly unsymmetrical and frequently a little falcate, 2½ to 5 lines long and 1½ lines wide, the long stipe attached to the basal margin; floating fronds with shorter stipes and cavernous throughout the central portion; submerged fronds with long twisted stipes; seed prominently 12 to 15-ribbed.

Cold springs and running water.

4. *L. cyclostasa* (Ell.) Chev. Fronds solitary or more commonly 2 to 8 cohering in a more or less curved chain, thin, oblong to obovate-oblong, usually somewhat falcate, $\frac{1}{8}$ to $\frac{3}{4}$ lines wide by 1 to $1\frac{1}{4}$ lines long, without papillae; base of the frond usually unsymmetrical, tapering into a short stipe or frequently sessile; fruit long-ovate, pointed by the long, straight or rarely curved style; seed 12 to 29-ribbed.

Springs at foot of Uncle Sam Mt. (Mt. Konokti), Lake Co., Bolander.

5. *L. minima* Phil. Fronds cohering in twos, sometimes in fours, or solitary, oblong to elliptical, symmetrical, $\frac{1}{2}$ to $1\frac{1}{4}$ lines wide, $\frac{3}{4}$ to 2 lines long, rather thick, with a row of papillae along the mid-nerve; lower surface flat or slightly convex, upper surface slightly to prominently convex with thin margin entirely around the frond; frond cavernous in the middle portion only, commonly nerveless; seed oblong, pointed, about 16-ribbed.

Two growth stages; smaller fronds straw-yellow or pale green and strikingly convex on the upper surface; larger fronds thinner and green-colored.

2. *WOLFFIA* Horkel.

Very minute plants. Fronds rootless, thin, unsymmetrical, curved in the form of a segment of a band, abundantly punctate on both surfaces with brown epidermal pigment cells. Stipe attached on the margin of the single reproductive pouch which appears as a cleft in the basal margin of the frond. (J. F. Wolff, student of the genus *Lemna*.)

1. *W. lingulata* Hegelm. Fronds at maturity solitary or rarely in 2s, broadly tongue-shaped, $\frac{3}{4}$ to $1\frac{1}{2}$ lines wide, $1\frac{1}{4}$ to $3\frac{1}{4}$ lines long, cavernous throughout the lower central portion; reproductive pouch triangular.

Irrigation canals, Kern Co., Thompson.

JUNCACEAE RUSH FAMILY.

Annual or perennial herbs. Stems simple, terete or ancipital, hollow or spongy. Leaves alternate, sheathing, narrow, flat or terete. Flowers lily-like in structure, sedge-like in aspect, small, dry, perfect, disposed in terminal or apparently lateral heads, spikes, sub-umbellate clusters or panicles. Perianth consisting of 6 distinct similar glume-like segments. Stamens 6 or sometimes 3. Ovary superior, 3 or sometimes 1-celled; stigmas 3, filiform; ovules 3 to many. Fruit a loculicidally 3-valved capsule. Embryo minute, enclosed in fleshy endosperm. In both the genera *Luzula* and *Juncus*, individuals of the same species vary greatly in aspect owing to the tendency of the inflorescence to become either capitately-congested on the one hand or loosely paniculate on the other. (The specific keys and descriptions in this family have been done by Mr. J. Burt Davy.)

Leaves stiff, terete or flat; stems usually with spongy pith; capsule 3 or 1-celled; seeds several to many.....1. *JUNCUS*.
Leaves soft, flat; stems hollow; capsule 1-celled; seeds 3.....2. *LUZULA*.

1. *JUNCUS* L. RUSH.

Plants of swamps or wet places; herbage glabrous. Stems usually with spongy pith. Leaves stiff, terete, channeled or flat. Flowers panicked, corymbose or in dense clusters, greenish or brownish. Capsule 3-celled with central placenta or 1-celled with 3 parietal placenta, many-seeded. For detecting the markings on the seeds of most of the *Junci*, a $\frac{2}{3}$ or $\frac{1}{2}$ in. objective is neces-

sary. (Classical name for the Rush, perhaps from Latin *jungo*, to join, the stems used for binding.)

Annuals; roots fibrous.

Leaves cauline; stems branched; flowers cymosely arranged in twos or threes and second; testa finely striate and cross-lined.....1. *J. bufonius*.

Leaves radical; stems scapiform; flowers solitary, terminal; testa reticulate.....2. *J. uncialis*.

Perennials; rhizomes mostly stout and creeping.

Leaves terete or wanting; panicle lateral, sessile.

Stamens 6.

Perianth $2\frac{1}{2}$ to 3 lines long; anthers 1 line long; capsule oblong-ovate, acute.....3. *J. leseurii*.

Perianth $1\frac{1}{2}$ lines long; anthers $\frac{1}{2}$ line long; capsule sub-globose, slightly angled, obtuse, apiculate.....4. *J. patens*.

Stamens 3.

Perianth 1 line long; anthers $\frac{1}{2}$ line long; capsule clavate-obovate, obtuse or retuse.....5. *J. effusus*.

Leaves flat, channeled; panicle terminal.

Stems terete; leaves not equitant nor transversely ribbed.

Rootstocks tufted; stems naked above, leafy at base; leaves less than $\frac{1}{2}$ line wide; flowers solitary in a diffuse or rarely compact panicle.....6. *J. tenuis*.

Rootstocks creeping; stems leafy throughout; leaves $1\frac{1}{2}$ lines wide; flowers clustered.....7. *J. falcatus*.

Stems ancipitally compressed; leaves equitant, transversely ribbed by internal septa. Leaves 2 to 4 lines wide; stems more or less winged below the nodes; seeds reticulate.....8. *J. xiphioides*.

Leaves $\frac{1}{2}$ to 1 line wide; stems not winged; seeds with the longitudinal lines closely crossed by prominent fine transverse ridges.....9. *J. phaeocephalus*.

1. **J. bufonius** L. TOAD RUSH. Annual; roots fibrous; stems 1 to 12 in. high, terete, branching from the base, leafy; leaves narrow; inflorescence a dichotomous cyme; flowers solitary and remote, to closely second or even sub-capitate; perianth lobes 3 lines long, long acuminate, greenish with white scarious margins.

One of the commonest species, exceedingly variable in size and aspect: Agnews; Marin Co.; Solano Co.; Napa Valley; Sonoma Co.; Berkeley; Stege. May-Sept.

2. **J. uncialis** Greene. DWARF RUSH. Depauperate annual $\frac{3}{4}$ to 1 in. high; leaves short, radical; stems scapiform, strictly 1-flowered; perianth-segments $1\frac{1}{2}$ to 2 lines long, acute, hyaline, with a prominent mid-nerve; capsule obtuse, apiculate, equaling the perianth; testa reticulate.

Type locality: "low moist places in fields near Suisun, California, May, 1890," Greene.

3. **J. leseurii** Boland. SALT RUSH. Perennial; rootstock stoutish, creeping and widely spreading; stems 1 to 3 ft. high, stout, erect, terete, leafless; panicle lateral, lax, many-flowered; flowers often somewhat second; perianth 2 to 3 lines long; stamens 6; anthers 1 line long; capsule oblong-ovate, acute.

Salt-marshes and alkali soils, not uncommon. June.

4. **J. patens** Mey. COMMON RUSH. Perennial, forming dense clumps; rootstock creeping; stems slender, densely tufted, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, erect, terete, leafless; panicle lateral, lax, many-flowered; perianth $1\frac{1}{2}$ lines long; stamens 6; anthers $\frac{1}{2}$ line long; capsule sub-globose, slightly angled, obtuse, apiculate.

A very common species in marshy or springy ground: San Francisco; Oakland Hills; Suisun Marshes; Mill Valley. June-July.

5. **J. effusus** L. var. **brunneus** Engelm. BOG RUSH. Perennial, forming dense clumps; rootstock creeping; stems stout, tufted, $1\frac{1}{2}$ to 3 ft. high, erect, terete, leafless; panicle lateral, compact, many-flowered; perianth dark brown,

1 line long; stamens 3; anthers $\frac{1}{2}$ line long; capsule clavate-obovate, obtuse or retuse.

Common in marshy ground: Monterey to San Francisco and Bolinas bays and northward.

6. *J. tenuis* Willd. YARD RUSH. Perennial, forming dense clumps; rootstock tufted; stems slender, 1 to 2 ft. high, very leafy at base, naked above, terete; leaves less than $\frac{1}{2}$ line wide, grass-like, 9 in. long; panicle terminal, loose, spreading; spathe exceeding the inflorescence, 8 to 16 lines long; perianth-segments pale; stamens 6. Var. *CONGESTUS* Engelm.; panicle somewhat capitate; common near the coast.

Oakland Hills; Marin Co. Apr.-June.

7. *J. falcatus* Mey. Perennial; rootstock slender, creeping; stems 6 to 9 in. high, more or less leafy, terete; leaves usually equaling or exceeding the stems, $1\frac{1}{2}$ lines wide, not ribbed by transverse septa; flowers in dense many-flowered terminal heads, which are solitary or in twos or threes; spathe about equaling the inflorescence; perianth-segments dark brown, concolorous or with a broad green midvein.

San Francisco; Santa Cruz Mts.; Mar. Var. *PANICULATUS* Engelm. Heads smaller, 3 to 5-flowered, in a more or less cymose panicle.—Mendocino City; Lake Co. June.

8. *J. xiphioides* Mey. MARSH RUSH. Perennial; rootstock elongated, stout, nodes distant; stems $1\frac{1}{2}$ to 3 ft. high, erect, leafy, ancipitally compressed, more or less distinctly winged below the nodes; leaves 2 to 4 lines wide, compressed, equitant, the spaces between the veins divided into segments by distinct transverse septa; inflorescence usually much exceeding the leaves, terminal; flowers in a cymosely-paniculate inflorescence of densely few or many-flowered heads; perianth usually dark-colored, about $2\frac{1}{2}$ lines long; stamens 6; anthers usually small; style very short; seeds elongate, reticulate, with minute cross-lines within the reticulations.

A common species in salt-marshes and moist places: Cloverdale; Pajaro Hills; Berkeley; Belmont. June. Var. *AURATUS* Engelm. is characterized by the lax cymosely-paniculate inflorescence of usually pale-colored flowers.—Suisun Marshes; Stege; Saratoga. Sept.-Oct.

9. *J. phaeocephalus* Engelm. Perennial; rootstock elongated, stout; nodes somewhat distant; stems $\frac{2}{3}$ to $1\frac{1}{2}$ ft. high, erect, leafy, ancipitally compressed, not winged; leaves $\frac{1}{2}$ to 1 line wide, compressed, equitant, more or less distinctly ribbed by transverse septa; inflorescence usually barely exceeding the leaves, terminal; flowers in densely many-flowered solitary or binate heads; perianth dark brown, $1\frac{1}{2}$ to 2 lines long; stamens 6; anthers large; style long; stigmas exerted; seeds ovoid, the longitudinal lines closely crossed by prominent fine transverse ridges.

Apparently less common than the preceding species: San Francisco; San Mateo Co. June.

2. LUZULA DC. WOODRUSH.

Plants of dry or high ground in open or shady places. Stems hollow, leafy, simple, slender. Leaves softer and flatter than in *Juncus*, grass-like and often hairy or villous. Flowers solitary in umbels or panicles or crowded in dense clusters or spikes. Capsule 1-celled; seeds 1 to 3. (Latin *lucus*, wood or grove, on account of the habitat of certain species.)

1. *L. comosa* Mey. COMMON WOOD-RUSH. A sparsely villous perennial;

rootstocks sparsely tufted; stems erect, leafy, 12 in. high; leaf-blades 3 to 6 in. long, 2 to 3 lines wide, flat, villous at the throat and sparsely so on the margins; bract foliaceous, much exceeding the inflorescence; inflorescence $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; flowers spicate; spikes erect, simple or cymosely pedunculate; bractlets scariosus, hyaline and ciliate above; perianth lobes $1\frac{1}{2}$ lines long, tinged with dark brown.—(*Juncoides comosum* Sheldon.)

One of the earliest flowers of spring, frequenting partially shaded spots. Mar.-Apr. Var. *SUBSESSILIS* Wats. has solitary or few nearly sessile loose pale-colored spikes.—*Olema*. Var. *CONGESTA* Thuill. has several close sessile spikes forming a more or less conical head.—Lake Merced.

LILIACEAE. LILY FAMILY.

Ours perennial herbs. Stems from bulbs, corms or rootstocks, either scape-like and the leaves all radical, or more or less leafy and frequently branching. Flowers regular and perfect; perianth with 6 segments or lobes, usually colored alike; when strongly differentiated by shape or color, the outer 3 are called sepals and the inner 3 petals. Stamens 6, sometimes 3 or 4. Ovary superior, commonly 3-celled; styles 3, or 1 and 3-cleft or with 3 stigmas. Fruit a capsule or berry. *Maianthemum* has a 2-merous flower, *Scelopopus* a 1-celled ovary, and *Veratrum* polygamous flowers. The perianth-segments are distinct except in *Brodiaea* and *Odontostomum*. Cauline leaves alternate, sometimes whorled in *Fritillaria* and *Lilium*, netted-veined and whorled in *Trillium*.

A. Fruit a capsule.

1. Plants with bulbs or corms.

Stems from a scaly bulb; leaves cauline and often whorled, or sometimes mostly at base.

Flowers $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; style often 3-cleft; perianth-segments with a more or less circular nectar-bearing area towards the base.....1. *FRITILLARIA*.

Flowers much larger, always showy; style entire; perianth-segments not bearing nectaries, but with a nectar-bearing groove towards the base.....2. *LILIUM*.

Stems from corms; leaves all at base and the stems either scapes or scape-like, or with few or reduced cauline leaves in no. 5 and in some species of no. 4.

Flowers solitary or racemose, bractless, borne on a scape-like stem; perianth-segments equal or nearly so; leaves 2, at the base of the stem, broad.....3. *ERYTHRONIUM*.

Flowers solitary on a simple stem, terminal on the branches or umbellately fasciated but without involucre or circle of bracts; outer perianth-segments commonly greenish and much smaller than the inner showy ones which usually bear a conspicuous glandular pit near the base; leaves few, narrow and elongated, all radical, or 1 or 2 cauline.....4. *CALOCHORTUS*.

Flowers in racemes terminating the branches; bracts subulate; perianth with a narrow tube and reflexed segments; stamens 6; staminodia 6.....5. *ODONTOSTOMUM*.

Flowers in umbels, always with 2 or more bracts; leaves all radical.

Perianth-segments united below into a tube; stamens 6, often with appendaged or winged filaments or 3 of the stamens replaced by dilated sterile filaments or staminodia.....6. *BRODIAEA*.

Perianth-segments distinct or nearly so.

Filaments arising from a cup-like appendage.....7. *BLOOMERIA*.

Filaments not appendaged, sometimes dilated at base.

Leaves semi-terete; bracts 4 to 6.....8. *MULLIA*.

Leaves plane or convolute-filiform; bracts 2 or 3.....9. *ALLIUM*.

Stems from tunicated bulbs; perianth-segments distinct; leaves all or mainly radical. Style 3-cleft, at least slightly; capsule loculicidal, as in all the preceding.

Flowers in a simple raceme borne on a scape.....10. *CAMASSIA*.

Flowers racemose in a widely branching very ample panicle.....11. *CHLOROGALUM*.

Styles 3, distinct; capsule deeply 3-lobed, septicidal; flowers in a raceme or panicle, the perianth-segments with green glands at base.....12. *ZYGADENUS*.

2. Plants with rootstocks.

Stamens 6; stems simple.

Stem with broad leaves suggesting a cornstalk; styles 3, distinct; flowers in a pubescent panicle.....13. *VERATRUM*.

- Stem with the numerous sedge-like leaves mostly radical, those above reduced.
 Flowers in a dense raceme; filaments glabrous; styles 3, distinct...14. *XEROPHYLLUM*.
 Flowers in loose racemes; filaments densely woolly; style one, undivided.....15. *NARTHECIUM*.
 Stem bearing at summit a whorl of 3 broad netted-veined leaves and a single large flower; stamens 6.....16. *TRILLIUM*.
 Stamens 3, opposite the sepals; caulescent; leaves 2.....17. *SCOLIOPUS*.

B. Fruit a berry; plants with rootstocks.

- Leaves broad.
 Stem very short, the leaves arising from near the surface of the ground; flowers red, in umbels, raised on a peduncle.....18. *CLINTONIA*.
 Stem simple, leafy; flowers very small, white.
 Raceme short, simple, terminal; perianth-segments and stamens 4, leaves 1 to 3, cordate, petioled.....19. *MAIANTHEMUM*.
 Raceme simple or compound, terminal, composed of many small flowers; leaves several to many, sessile.....20. *SMILACINA*.
 Stem branching; flowers axillary at the ends of the leafy branches.....21. *DISPORUM*.
 Leaves reduced to scales; branchlets filiform, clustered in the axils; bushy-branching plant.....22. *ASPARAGUS*.

1. FRITILLARIA L.

Stems erect, simple, from a bulb of thick fleshy scales, bearing narrow sessile, alternate or whorled leaves; radical leaves large, ovate or elliptic, borne only in the year or years before the flowering stalk appears. Flowers in racemes or solitary, dull purple, brownish, whitish or red. Perianth campanulate to funnel-form, deciduous, of 6 distinct segments, each segment with a shallow nectar-bearing area near the base. Stamens 6, inserted on the base of the segments, included; filaments slender; anthers extrorse, more or less versatile. Ovary sessile or nearly so. Capsule membranous, 6-angled or winged, loculicidally 3-valved. Seeds numerous, in 2 rows in each cell. (Latin fritillus, a dice-box, on account of the shape of the flower.)

Styles united, stigma shortly 3-lobed; perianth pink, of a uniform color, *i. e.*, not spotted; glands obscure.....1. *F. pluriflora*.
 Styles 3-parted above; stigmas linear; glands mostly obvious.

Leaves in 2 to 3 whorls on the upper part of the stem or the uppermost alternate; capsule winged.

Perianth scarlet.....2. *F. coccinea*.

Perianth dark purple, mottled or checkered with greenish yellow.....3. *F. lanceolata*.

Leaves mostly basal, not in distinct whorls; capsule obtusely angled.

Raceme many-flowered; perianth yellowish green, not spotted, 1 to 1½ in. long.....4. *F. agrestis*.

Raceme 1 to 3-flowered; perianth white or nearly so, ½ to ¾ in. long.....5. *F. liliacea*.

1. ***F. pluriflora* Torr.** PINK FRITILLARY. Stems 6 to 10 in. high, from a somewhat yellowish bulb of few (6 to 8) scales; leaves few, oblong-lanceolate, 4 in. long, mostly basal; perianth uniform pink-purple, the segments obovate-oblong, acutish, 1 in. long; glands obscure; capsule as broad as long, truncate at apex, narrowed toward the base, strongly 3-lobed, each lobe with 2 longitudinal dorsal ridges or wings with intervening depression.

Foothills in adobe soil: Solano and Yolo cos.; upper Sacramento Valley, east side.

2. ***F. coccinea* Greene.** SCARLET FRITILLARY. Stems slender, 10 to 18 in. high; leaves 3 to 7, narrowly linear, 2½ in. long; flowers 1 to 4, campanulate-funnel-form, scarlet, evidently mottled, ¾ to 1½ in. long; segments recurving at tip, gland near base of segment small, narrowly oblong, 3 lines long.

Mt. Hood and Napa ranges and north to Eden Valley.

3. ***F. lanceolata* Pursh.** CHECKER LILY. Stems 1½ to 2 ft. high; scales few or none, the lower portion of the solid bulb covered with numerous rice-grain bulblets; leaves 6 to 9 in 2 or 3 whorls on the upper part of the stem

or scattered, ovate-lanceolate, 2 to 4 in. long; racemes 1 to 4-flowered; perianth deeply bowl-shaped, dark-purple mottled with greenish yellow, 1 to $1\frac{1}{2}$ in. long; segments ovate to oblong, deeply concave, with a very large ovate-lanceolate gland in middle of concavity; gland deep green, sharply defined, often with minute black dots; capsule broadly winged, less than 1 in. long.

Near the sea: San Mateo to Pt. Reyes and northward. Also called Rice-root Lily. The bulbs live just one year (Carl Purdy). The solid bulb is very characteristic, all of our other species having scaly bulbs. Feb.-Mar. Var. *FLORIBUNDA* Benth. Mission Bells. Raceme 3 to many-flowered; perianth campanulate, dark purple or greenish, conspicuously spotted or checkered, 6 to 13 lines long; segments broadly oblong or narrowly ovate, distinctly crisped or erosulate-margined, the outer often broader; gland greenish, broadly lanceolate, extending from the base $\frac{1}{2}$ or $\frac{2}{3}$ the way to the apex.—Shady woods, Coast Ranges (*F. mutica* Lindl.). Var. *GRACILIS* Wats. Very small flowers and narrower more acuminate segments; anthers scarcely longer than broad.—Corte Madera and northward to Napa Valley.

F. BIFLORA Lindl. Black Lily. Stem stout, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, 2 to 3 (rarely 1)-flowered; leaves 2 to 6, mostly near the base, scattered or somewhat whorled, broadly to narrowly oblong, 2 to 4 in. long; perianth campanulate, greenish or mostly dark purple or purple-lined, 8 to 12 lines long; segments oblong, tapering to each end, or the inner segments elliptic-obovate, all with a longitudinal greenish glandular band running from the base nearly to the apex.—San Luis Obispo and southward to Southern California. Also called Chocolate Lily (Ernest Branton).

4. *F. agrestis* Greene. STINK BELLS. Stems 1 to $1\frac{1}{2}$ ft. high, from very deep-seated bulbs; leaves 8 to 12, oblong-oblancoate to linear-lanceolate, 4 to 5 in. long; raceme 3 to 8-flowered, the flowers nodding on the pedicels which are abruptly recurved at summit; perianth yellowish green, the broadish mid-nerve prominent and running nearly to apex; segments 1 to $1\frac{1}{4}$ in. long, 4 to 5 lines wide.

Antioch, in grain fields. Odor very obnoxious. Possibly introduced in grain seed (Mrs. K. Brandegee).

5. *F. liliacea* Lindl. WHITE FRITILLARY. Stems 3 to 8 in. high, often somewhat stout and succulent, 1 to 5-flowered; leaves of the radical tuft narrowly or broadly oblong, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long; cauline leaves few, linear-oblong or linear; flowers dull white; perianth-segments oblong-ovate to obovate, 6 to 9 lines long, with a greenish purple-dotted gland at base, the greenish area sometimes extended upwards along the mid-vein nearly or quite to the apex; capsule stipitate, truncate at each end, $\frac{1}{2}$ in. long and as broad.

Open rocky hilltops: San Francisco; Vallejo; Olema, acc. Mrs. D. O. Hunt.

2. LILIUM L. LILY.

Stems simple, tall and leafy, from a scaly bulb or scaly rootstock. Leaves narrow, sessile. Flowers large and showy, solitary or 2 to several in a terminal raceme. Perianth campanulate or funnelform; its segments 6, yellow, red or white, often dotted or spotted with brown, distinct, equal, spreading or recurved, with a nectar-bearing groove toward the base. Stamens 6, hypogynous, included; anthers versatile. Style one, long, deciduous; stigma 3-lobed. Capsule loculicidal; seeds numerous, flat, horizontal, in 2 rows in each cell. (Greek *lilion*, the classical name.)

Scales jointed; flowers red or orange.

Flowers with strongly revolute segments ("Turk's Cap" type)....1. *L. pardalinum*.
 Flowers funnellform, the upper third of the segments recurving.....2. *L. maritimum*.
 Scales not jointed; flowers funnellform, white, aging reddish.....3. *L. rubescens*.

1. *L. pardalinum* Kell. TIGER LILY. Stems 3 to 6 ft. high; rootstock thick and fleshy, closely covered with 2 or 3-jointed closely overlapping scales, branching and eventually forming large mat-like clusters; leaves in whorls or alternate, linear-lanceolate; flowers 1 to many, racemose or the lower in whorls, on long spreading pedicels; segments 2 to 3 in. long, 6 to 9 lines wide, strongly revolute, bright orange-red with a lighter orange center and large purple spots on the lower half; capsule narrowly oblong, acutely angled, $1\frac{1}{2}$ in. long.

Stream banks and wet meadows: Coast Ranges, near the sea or in high mts.; Sierra Nevada, 3000 to 4000 ft. Also called Leopard Lily. June-Aug.

L. parvum Kell. Rootstock like preceding but not branching; scales 3 or 4-jointed; flowers small (1 to $1\frac{1}{4}$ in. long), funnellform, only the tips of the segments spreading.—Sierra Nevada, 6000 to 9000 ft., in wet places along streams or edges of swamps.

L. parryi Wats. Lemon Lily. Rootstock not branched; flowers clear lemon yellow.—Southern California mts.

2. *L. maritimum* Kell. COAST LILY. Stems 1 to 4 ft. high with alternate or rarely whorled leaves; bulb rhizomatous; leaves narrowly oblanceolate or linear, 1 to 5 in. long and 3 to 7 lines wide; flowers 1 to 5, dark red, funnellform, horizontal on long pedicels; segments spotted within with purple, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long, the upper $\frac{1}{3}$ somewhat recurved; stamens less than 1 in. long, exceeding the style; capsule said to be long and narrow.

Low meadows near the coast from Marin Co., northward to Ten Mile River, Mendocino Co.

3. *L. rubescens* Wats. CHAPARRAL LILY. Stems 2 to 5 ft. high; bulbs rhizomatous, the scales not jointed; leaves broadly oblanceolate or obovate, mostly acute, 5 to 10 in a whorl, or the lower scattered; flowers several on ascending pedicels 1 to 3 in. long, nearly white, somewhat dotted with brown, aging to rose-purple; segments $1\frac{1}{2}$ or 2 in. long, the upper $\frac{1}{3}$ revolute; capsule obovoid with subtruncate apex and abruptly short attenuate base, wing-angled, $1\frac{1}{4}$ in. long.

Chaparral slopes in the mountains from Marin Co. to Howell Mt. and northward. Near the coast called Redwood Lily; towards the interior Chaparral or Chamise Lily.

L. humboldtii R. & L. Stems 3 to 5 ft. high, very stout; bulb large, ovoid, more or less oblique, its scales not jointed; flowers large, orange-red, spotted with small maroon spots, the segments strongly recurving.—Open woods in lower Yellow Pine belt of Sierra Nevada north of Yosemite, 3000 to 4000 ft. Bulb-scales possessing a remarkably bitter principle.

L. washingtonianum Kell. Washington Lily. Stems 4 to 6 ft. tall, the bulb ovate, scales not jointed; flowers pure white, purple-dotted, aging purplish, very fragrant, tubular-campanulate, the segments spreading above, not closely approximate in tube.—Sierra Nevada, 3000 to 6000 ft., in the upper pine forests or in thickets. Shasta Lily is a variety with a small bulb.

3. ERYTHRONIUM L.

Low herbs with short simple scape-like stems from deep-seated membranous-coated corms. Leaves 2, radical or nearly so. Plants before coming into

flower (first or second year) are stemless, producing simply one broad long-petioled leaf. Flowers large, solitary or several and racemose; perianth-segments distinct with longitudinal nectar-bearing groove and 2 or 4 scale-like processes at base, or only the inner segments so provided. Stamens 6, hypogynous, shorter than the perianth. Style 3-lobed or -cleft; stigmas 3. Capsule somewhat 3-angled, loculicidal. (Greek *eruthros*, red, the color of the flowers in some species.)

1. *E. californicum* Purdy. FAWN LILY. Scapes 5 to 9 in. high, 1 to 2 or even 5-flowered; leaves mostly 2, oblong, obtuse, 4 to 6 in. long, 1 to 1½ in. wide; flowers nodding, creamy white, the base of the segments orange; segments broadly oblong, tapering from the middle or below the middle to base and apex, 1¼ in. to 1½ in. long, 5 to 7 lines wide, auricled at base; inner segments longitudinally 2-channeled on back; capsule obovoid, 1 in. long.—(*E. grandiflorum* Wats. et al., not Pursh.)

Middletown and Healdsburg to Cloverdale (where it is very abundant and called "Easter Lily") and northward to Ukiah and Round Valley. Mar. Corms slender, not producing offsets.

E. HARTWEGII Wats. Corms forming offsets freely at the end of filiform filaments originating from their base; leaves richly mottled; flowers white or cream with orange or yellow base, borne in an umbel which is sessile between the leaves, each flower thus appearing to be raised on a scape of its own; inner segments auricled.—Sierra Nevada foothills, Tehama to Mariposa cos.

E. PURPURASCENS Wats. Leaves not mottled, undulate-margined, dark metallic green; flowers very small, light yellow, tinged purple after a few days, 1 to 8 crowded on a raceme; filaments filiform.—Sierra Nevada, Placer to Plumas cos., above 4000 ft.

E. REVOLUTUM Sm. Scapes 1 or 2-flowered; leaves lightly mottled; flowers white or light-pink, aging purplish; filaments broadly dilated, almost convining around style.—Mendocino and Humboldt cos., 10 to 15 miles from the coast, in a strip about 4 miles wide (Carl Purdy), and far northward.

4. *CALOCHORTUS* Pursh. MARIPOSA LILY.

Stems from membranous-coated corms, with few narrow radical or cauline leaves and showy white, yellow, lilac or bluish flowers borne terminally on the stem or branches or in an umbellate fascicle. Perianth deciduous, the segments distinct and more or less concave. Sepals lanceolate, greenish or sometimes colored. Petals for the most part broadly cuneate-obovate and usually with a conspicuous gland or pit near the base. Stamens 6, on the base of the segments. Ovary triquetrous; stigmas sessile, recurved, persistent. Capsule elliptical or oblong, membranaceous, 3-angled or -winged, commonly septically dehiscent. Seeds numerous, in 2 rows in each cell, somewhat flattened. (Greek *kalos*, beautiful, and *chortos*, grass, in allusion to the flowers and grass-like leaves.)

Flowers and capsule erect, the former open campanulate; gland densely hairy; stem bearing bulblets at base; radical leaves usually a pair, channeled, linear.—MARIPOSA LILIES.

Petals mostly white or lilac, with an eye-spot; gland round; capsule linear or linear-clavate 1. *C. venustus*.

Petals clear lilac; gland small, round and densely hairy, or absent; capsule linear.... 2. *C. splendens*.

Petals yellow, usually without eye-spot; gland lunate; capsule attenuate from a broad base 3. *C. luteus*.

Flowers erect or ascending, campanulate; petals with a transverse scale covering upper

portion of gland; capsule nodding; stem low, bulblet-bearing in none of the following except the first; the radical leaf long and conspicuous, surpassing the inflorescence.—STAR TULIPS.

Petals lilac, glabrous or nearly so; stem bulblet-bearing at base; open wet meadows.

4. *C. uniflorus*.

Petals white with scant hairs on lower third; woodland plants.....5. *C. umbellatus*.

Petals white or purplish blue, covered with long erect hairs.....6. *C. maweanus*.

Flowers and capsules nodding; petals strongly incurved or arched, the gland transversely crested or hairy; capsule elliptical or broadly oblong, deeply triquetrous, the lobes thin, acute or winged.—GLOBE TULIPS.

Petals white; glands lunate, with 4 transverse imbricate scales fringed with short glandular hairs.....7. *C. albus*.

Petals yellow.

Gland clothed with long thick hairs; petals above gland with scattered hairs.....

8. *C. pulchellus*.

Gland bordered with stiff hairs which cross each other; petals above gland glabrous.

9. *C. amabilis*.

1. ***C. venustus*** Dougl. WHITE MARIPOSA LILY. Stem erect, stiff, usually branching, 4 to 10 in. high, 1 to 4-flowered; bulblet at base usually 1; radical leaves 1 or 2, linear, 1 to 3 lines wide, very glaucous; pedicels 2 to 8 in. long; sepals oblong-lanceolate, acuminate, 1 to 1½ in. long; petals broadly cuneate-ovate, 1 to 1¾ in. broad, 1 to 2 in. long, white to lilac with an eye-spot in the middle, frequently penciled toward the base, and often with a transversely oblong rose-colored blotch near the apex; gland roundish, lunate, or oblong, densely matted with short hairs; filaments dilated, shorter than or a little exceeding the anthers; capsule linear or linear-clavate, 2 to 3½ in. long, the sides obliquely and rather closely veined.

Light sandy soil or in alkaline fields: Coast Ranges; Great Valley; Sierra Nevada.

2. ***C. splendens*** Dougl. MARIPOSA LILY. Stems often bulblet-bearing at base, 1 to 1½ ft. high, slender; sepals ovate, acuminate, about equaling the petals; these broadly fan-shaped, clear lilac, with long scattered hairs below the middle, 1 to 1¼ in. long, about as broad as long; gland small and round, covered by a dense mass of short hairs, or absent; filaments 3 times as long as the anthers; capsule linear.

Eastern Lake and Colusa cos. to Monterey and southward.

3. ***C. luteus*** Dougl. YELLOW MARIPOSA LILY. Stem erect, slender, often branching, 7 to 10 in. high; bulblets enclosed within radical sheath of stem; radical leaves linear, 1 to 3 lines wide; sepals narrowly ovate-lanceolate, acute, yellowish within; petals fan-shaped, as long as broad, with a rather obvious claw, yellow or orange, usually without a central blotch but with penciled lines radiating from gland to center of petal, ¾ to 2 in. long; gland broad, lunate, densely hairy, with ascending matted yellow hairs; above this to middle of petal the hairs few and scattering; stamens about equaling style, the filaments not dilated or slightly toward the base, a little longer than the anthers; capsule attenuate from a broad triangular base, 1½ to 2 in. long.

Coast Ranges, foothills and low rolling gravelly or dry land. May.

4. ***C. uniflorus*** H. & A. Stem low, flexuous, 4 to 8 in. high, with 1 to 4 bulblets beneath the surface; radical leaves 4 to 6 lines broad, exceeding the stem; bracts linear-lanceolate, long, and conspicuous; flowers 2 to 10 in. 1 to 3 umbels, on long flexuous pedicels which are 3 to 10 in. long; sepals ovate-lanceolate, greenish-lilac; petals lilac, cuneate, somewhat truncate, denticulate, 10 to 12 lines long, naked above, sparingly hairy immediately above the gland; this shallow, not pitted, with a narrow triangular appressed scale.

Calistoga to Monterey in low wet lands. Apr.-May.

5. *C. umbellatus* Wood. Stems 3 to 10 in. high, not bulblet-bearing, simple or branching; herbage glaucous; radical leaf solitary, exceeding the inflorescence; flowers 2 to 6; sepals oblong, acuminate, greenish-white, or slightly tinged with lilac; petals white or slightly lilac-tinged, obovate, or fan-shaped, slightly concave, 6 to 9 lines long; gland covered by an ascending appressed scale, which on its upper (free) margin is lightly fringed; on each side of the gland is a hairy area (with a purple spot below it), the petals otherwise naked; stamens $\frac{1}{3}$ the length of the petals.

Low wooded hills: Marin Co.; Oakland Hills; Walnut Creek. Apr.

6. *C. maweanus* Leicht. PUSSY'S EARS. Stem mostly simple, 3 to 5 in. high, bearing an umbel of 2 to 4 flowers and with mostly 1 radical leaf (1 ft. long or less and 3 to 8 lines wide) which much surpasses the inflorescence; sepals oblong or elliptical and acute, or ovate-lanceolate, equaling or much shorter than the petals; these orbicular, obovate or somewhat rhomboidal, with a broadly or abruptly acute apex, 6 to 10 lines long, the upper surface covered with long white or bluish hairs; gland covered above with a narrow transverse scale, the petal densely hairy above the scale and naked below the pit.

San Francisco Bay northward in the Coast Ranges. Apr.

7. *C. albus* Dougl. WHITE GLOBE TULIP. Stem stout, glaucous, branching, 1 to 2 ft. high; radical leaves elongated lanceolate, acuminate, 1 to $1\frac{1}{2}$ ft. long, $\frac{1}{3}$ to 1 in. wide; bracts foliaceous, 3 to 5 in. long; sepals shorter than the petals, ovate, acuminate, greenish-white; petals white, purplish at base, ovate-orbicular, acutish, with scattering long silky yellow hairs above gland, 1 to $1\frac{1}{4}$ in. long; gland lunate, shallow, with 4 transverse upwardly imbricate scales, fringed with close short yellow or white glandular hairs; anthers oblong, mucronate; capsule 1 to 2 in. long, $\frac{1}{2}$ to 1 in. broad, abruptly short-beaked; seeds brown, pitted.

Coast Range woods near the coast from Ukiah to Monterey and southward to Southern California.

8. *C. pulchellus* Dougl. About 1 ft. high, much branched, each branch terminating in an umbel of 2 or 3 pendulous flowers, the bract surpassing the peduncle; sepals greenish, ovate-lanceolate, shorter than the light yellow petals, which above the gland are covered with scattered hairs, below it smooth and with the margins ciliate; gland placed a little below the center of the petal, the margin of the pit clothed with long and thick hairs.

Occurring on Mt. Diablo; collected in early days by Douglas at some unknown station and little known since.

9. *C. amabilis* Purdy. GOLDEN LILY BELL. Stem flexuous, dichotomously branching, varying in height from a few in. (and 2 or 3-flowered) to $1\frac{3}{4}$ ft. high (and 10 to 12-flowered); radical leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, elongated, green and glossy, equaling or exceeding the stem; bracts linear-lanceolate, exceeding or equaling the flowers, diminishing upward, the lowest $4\frac{1}{2}$ in. long; flowers on nodding pedicels, sub-globose, golden-yellow; sepals sometimes greenish, elliptic-ovate, abruptly acute, 12 to 15 lines long, a trifle shorter than the suborbicular petals which are conspicuously ciliate on the margin and strongly arched or incurved, their apices overlapping; gland a deeply-set pit (visible from the outside as a ridge or convexity) and covered by a dense fringe of appressed yellow hairs growing from the upper margin and which cross each other over the pit; petals otherwise glabrous; anthers oblong, 2 lines long, rather shorter than the filament; capsule elliptical, $1\frac{1}{4}$ in. long.

North Coast Ranges: Ukiah; Sonoma; Green Valley (Solano Co.); Vaca Mts. Apr. Also called Cat's Ears and Fairy Lantern.

5. ODONTOSTOMUM Torr.

Stems flexuous, branching, from a corm. Leaves linear, mostly radical, sheathing the stem. Flowers in bracted racemes terminating the branches. Perianth with a narrow tube and with the limb divided into 6 soon reflexed segments, the outer 3 slightly longer and cucullate at tip; stamens 6, inserted on the throat and alternating with as many short staminodia, those opposite the outer segments longer; the stamen opposite the lower outer segment stands alone and faces the remaining 5, which approximate each other by their filaments on the upper side of the flower. Ovules 2 in each cell but only 1 maturing. Capsule obovate, 3-lobed, loculicidal. (Greek odous, tooth, and stoma, mouth, on account of the erect subulate filaments at the throat of the flower.)

1. *O. hartwegii* Torr. Plants erect, 5 to 10 in. high; radical leaves 3 to 9 in. long, 2 to 3 lines wide with caudate-attenuate apex; racemes 2 to 5 in. long; bracts and bractlets subulate; perianth-tube 3 lines long, the reflexed segments nearly or quite as long, narrowly oblong, 5 or 6-nerved, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

Dry hard soil in the foothills: Napa Range; Sierra Nevada foothills. May.

6. BRODIAEA Sm.

Scapes from corms, erect and straight, or sometimes elongated and twining. Leaves mostly few and grass-like. Umbels loose or capitate. Pedicels jointed beneath the perianth. Perianth-tube various. Stamens 6, or the alternate stamens replaced by dilated sterile filaments or staminodia. Filaments slender or more frequently winged and produced beyond the anther in the form of thin appendages. Ovary on a short stipe or sessile. Capsule loculicidal, beaked by the style which splits with the valves. (James Brodie, F. L. S., Scotch botanist.)

Umbel loose, mostly few-flowered, borne on a short rigidly erect scape; pedicels firm; perianth-tube turbinate or urn-shaped; stamens inserted high on the perianth, those with anthers 3; those opposite outer segments changed to staminodia and bearing white petal-like plates; anthers innate; corms not flattened.—HOOKER.

Scapes almost wholly subterranean, the umbel sessile on the ground; staminodia yellowish 1. *B. terrestris*.

Scapes 3 to 18 in. high; staminodia white.

Perianth turbinate-campanulate; staminodia commonly retuse, longer than the stamens 2. *B. minor*.

Perianth-tube oblong with rotate or recurving segments; staminodia acute, mostly shorter than the stamens 3. *B. grandiflora*.

Umbel mostly capitate, many-flowered, borne on a straight erect or even very tall and twining scape; perianth-tube urn-shaped or tubular, angular or saccate and more or less inflated; stamens 6, all with innate anthers or those opposite the outer segments with half-sized anthers or changed to staminodia; leaves mostly 2, fleshy.—DICHLOSTEMMA.

Stamens with anthers 3.

Flowers scarlet with chrome-green segments; anthers bifid at each end; staminodia broad, truncate, corona-like 4. *B. ida-maia*.

Flowers rose-red or pinkish; filaments and staminodia emarginate; scapes very much elongated, commonly twining 5. *B. californica*.

Flowers blue-purple; anthers bifid at each end, sessile; staminodia deeply cleft 6. *B. congesta*.

Stamens with anthers 6; inner filaments with two lanceolate appendages extended beyond the anthers; bracts conspicuous, of a violet-purple or metallic color 7. *B. capitata*.

Umbel loose, many-flowered, borne on a straight, erect, and rather slender scape; flowers

blue, white, or yellow; perianth-tube narrowly turbinate to open-campanulate, not inflated nor angular nor saccate, longer or shorter than the segments; stamens 6; anthers versatile; filaments slender or winged; ovary on slender stipe or rarely subsessile; corms somewhat flattened.—*TRITELEIA*.

Flowers yellow; filaments dilated, forked at apex, the anther borne on a cusp in the middle of the notch.....8. *B. irioides*.
Flowers commonly blue or purple, sometimes pale or nearly white; filaments filiform, short.

Perianth-tube clavate at base; ovary bluish.....9. *B. laxa*.

Perianth-tube turbinate; ovary yellow.....10. *B. peduncularis*.

Flowers white; filaments with broadly triangular and slightly united bases.....11. *B. hyacinthina*.

1. *B. terrestris* Kell. Scape very short, scarcely rising above the surface of the ground, or altogether subterranean; umbels 2 to 10 or 20-flowered, the slender pedicels 3 to 4 in. long; perianth purple, 8 to 10 lines long, the limb rotate; anthers oblong, sagittate, $1\frac{1}{2}$ lines long, slightly longer than the filaments and shorter than the staminodia, these yellowish, emarginate and with revolute edges.—(*Hookera terrestris* Greene.)

Near the coast from Monterey and Watsonville to Mendocino; common in sandy soil in the region about San Francisco. June-July.

2. *B. minor* Wats. Scapes slender, 3 to 6 in. high, bearing an umbel of 2 to 5 blue flowers on pedicels 1 to $2\frac{1}{2}$ in. long; perianth 8 to 12 lines long, its tube oblong or even slightly inflated, the segments rotately spreading or often strongly recurved, each with a mid-vein, green on back and running down to base of perianth; outer perianth-segments narrowed towards the apex, mucronulate; inner segments broadly oblong, obtuse; anthers 2 lines long, sagittate at base, deeply bifid at apex; staminodia broadly ligulate or with somewhat involute margins, at apex commonly retuse and mucronulate, somewhat (often much) exceeding the anthers.—(*Hookera minor* Ktze.)

Dry and often gravelly soil of the plains and low hills of the Sacramento and San Joaquin valleys and southward to Southern California.

3. *B. grandiflora* Smith. HARVEST BRODIAEA. Scape stout, 7 to 18 in. high; leaves 1 line broad, thick or somewhat terete, about equaling the scape; umbels 3 to 11-flowered, pedicels unequal, 1 to $3\frac{1}{2}$ in. long; perianth violet-purple, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. long; segments narrowly oblong, longer than the tube, in age withering and becoming caudate; anthers 4 or 5 lines long, sagittate at base, entire at apex or nearly so, exceeding or at least equaling the oblong-lanceolate mostly acute staminodia; capsule stipitate, the body about 5 lines long.—(*B. californica* Lindl. *Hookera coronaria* Salisb.)

The most common species in the Bay region, flowering in May and early June at the time of the hay harvest when the hills and fields are turning brown. Also through the interior to the Sierra Nevada foothills.

4. *B. ida-maia* (Wood) Greene. FIRE-CRACKER PLANT. Scape slender, erect, 1 to 3 ft. high, bearing an umbel of 6 to 13 flowers with jointed pedicels $1\frac{1}{2}$ in. long or less; leaves linear; perianth-tube scarlet, persistent, broadly tubular, slightly 6-saccate at the truncate base, slightly constricted above, 1 to $1\frac{1}{4}$ in. long; segments chrome-green, short, erect or sometimes reflexed, 2 or 3 lines long; stamens 3, inserted on the throat opposite the inner segments, their filaments very short; anthers innate; staminodia 3, white; capsule triangular-ovate, acuminate, its stipe 2 or 3 lines long; seeds angular, black.—(*Brevortia ida-maia* Wood. *Brodiaea coccinea* Wats.)

Wooded foothills and mountain slopes from Marin Co. to Mendocino and Shasta cos. A showy and curious species.

5. **B. californica** Jepson, n. comb. TWINING BRODIAEA. Scape roughish, 2 or 3 ft. high and lax, or twining over bushes and attaining a height of 7 or 8 ft.; corm nearly 1 in. broad; leaves 1 ft. long or more, 4 to 6 lines broad, carinate; umbels short and dense, 18 to 30-flowered; pedicels $\frac{1}{2}$ to 1 in. long; perianth rose-red or pinkish, 6 to 8 lines long; tube 3 to 4 lines long and broad, 6-angled, the angles produced into sacs somewhat above the middle; segments rotate, their tips recurved; stamens 3, inserted on the throat opposite the inner segments, their filaments short, winged, emarginate; staminodia 3, opposite the outer segments, ligulate, emarginate; capsule ovate, acuminate, on a short stipe; seeds angled, black, usually 1 in each cell.—(*Stropholirion californicum* Torr. *Brodiaea volubilis* Baker. *Hookera volubilis* Jepson.)

Hill country of the Coast Ranges and foothills of the Sierra Nevada.

6. **B. congesta** Smith. OOKOW. Scape 2 to $3\frac{1}{2}$ (or even 5) ft. high, often flexuous; heads short-racemose, 6 to 16-flowered, subtended by 3 to 5 ovate sub-acuminate bracts 4 lines long; leaves as long or nearly as long as the scape, 2 to 6 lines wide; flowers blue or purplish, 7 to 8 lines long, in a dense head; perianth-segments spreading, oblong, shorter or longer than the tube, which is slightly constricted at apex, anthers 3, sessile; staminodia deeply cleft, wholly sterile, surpassing the anthers; capsule sessile, 5 lines long.—(*Hookera congesta* Jepson.)

Open hills in the Coast Ranges from the Oakland Hills northward. Apr.-May.

7. **B. capitata** Benth. BLUE DICKS. Scapes erect, 7 to 14 in. high, ending in a head-like umbel of 7 to 8 flowers, with about 4 dark purple or metallic bracts; bracts round-ovate or elliptic-oblong, 5 lines long; flowers blue, 7 lines long; perianth-segments elliptic-ovate, obtuse, 4 lines long; stamens with anthers 6; filaments opposite the inner perianth-segments with a broad membranous wing extended beyond the anthers as two lanceolate appendages; stamens opposite outer perianth-segments with filaments dilated toward the base only, their anthers less than $\frac{1}{2}$ the size of those of the other set; appendages convergent or connivent, forming a corona and more or less concealing the anthers.—(*Hookera capitata* Ktze.)

Very common on hillsides in the Bay region and southward to Southern California. Feb.-May.

8. **B. ixioides** (Ait. f.) Wats. GOLDEN BRODIAEA. Scape $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, usually scabrous; leaves 2, 14 in. long or less; umbels 16 to 26-flowered; pedicels $1\frac{1}{4}$ in. long or less; flowers about 10 lines long, salmon-yellow, with a conspicuous black-purple vein on the outside running from the apex to the base of each segment; stamens alternately long and short, the filaments dilated and bifurcate at the winged summit, the oblong anthers on a cusp in the notch.—(*Hookera ixioides* Ktze.)

Common in the foothills of the Coast Ranges and Sierra Nevada. May. Var. **LUGENS** Jepson. Broad appendages of the filaments rounded at apex, not forked; entire tube exteriorly dark brown, approaching black.—Vaca Mts.

9. **B. laxa** (Benth.) Wats. GRASS NUT. Scape 1 to 2 ft. high, rigid and stoutish, from a usually deep-seated edible corm; umbel 10 to 25-flowered; pedicels 1 in. long, more or less; perianth violet-purple, rarely white, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long, funnelform, clavate at base, its segments shorter than the tube; stamens 6, all anther-bearing; filaments inserted high on the perianth-tube, 2 lines long; anthers ovate-lanceolate with a 2-lobed base, $1\frac{1}{2}$ lines long; ovary on a slender stipe $\frac{1}{2}$ to $\frac{3}{4}$ in. long.—(*Hookera laxa* Ktze.)

Showy and beautiful species, common in adobe fields or on adobe hillsides. May.

10. **B. peduncularis** Wats. Scapes erect, $1\frac{1}{4}$ to 3 ft. high; umbel 3 to 15-flowered, the pedicels slender, $2\frac{1}{2}$ to 4 or even 6 or 10 in. long; perianth pale rose-purple or nearly white, 6 to 9 lines long, the segments longer than the tube, widely-spreading; ovary yellow; stipe of capsule $1\frac{1}{2}$ to 3 lines long.—(*Hookera peduncularis* Ktze.)

Low wet ground: Tiburon, Miss H. A. Walker (all the stamens with short filaments), and north to Lake Co.

11. **B. hyacinthina** Baker var. **lactea** Baker. WHITE BRODIAEA. Scapes 1 to $1\frac{1}{4}$ ft. high; umbels 20-flowered, more or less; pedicels from $\frac{1}{2}$ to 2 in. long; perianth open-campanulate, cleft below the middle, white or bluish white with green mid-veins, 5 to 7 lines long; filaments with broadly triangular and slightly united bases, attenuate above and tipped with an anther $\frac{1}{2}$ line long; ovary with 3 glandular pits towards the summit; capsule short-stipitate.—(*B. lactea* Wats. *Hookera hyacinthina* (Lindl.) Ktze. var. *lactea* (Baker) Jepson.)

Common in low moist ground in the Coast Ranges and Great Valley. Also called White-flowered Grass-nuts.

7. BLOOMERIA Kell.

Scape from a fibrous-coated corm. Leaves linear, carinate. Umbel with many yellow flowers; pedicels jointed at the summit and subtended by membranous bracts. Perianth persistent, of 6 nearly equal distinct linear-oblong segments. Stamens 6, inserted on the base of and rather shorter than the segments; filaments filiform, surrounded at base by a cup-like appendage which is free from the perianth. Capsule sub-globose; seeds 4 to 8 in each cell, angular and wrinkled; style persistent and splitting with the loculicidal capsule.—(H. G. Bloomer, a pioneer botanist of San Francisco.)

1. **B. aurea** Kell. GOLDEN BLOOMERIA. Scapes 6 to 9 in. high, minutely scabrous; leaves 2, one of them as long as the scape; pedicels 30 to 45, $1\frac{1}{2}$ to 2 in. long; bracts several, subulate-lanceolate; perianth-segments subrotate, 5 to 6 lines long; appendages minutely papillose; capsule nearly 3 lines long.

Pacheco Pass, New Idria, Monterey Co. and southward.

8. MUILLA Wats.

Like *Allium* but the herbage without the taste or odor of onions. Scape from a fibrous-coated corm and bearing an umbel subtended by several small scarious bracts. Leaves very narrow, almost terete. Bracts 4 to 6, lanceolate or linear. Perianth subrotate, persistent, of 6 nearly equal slightly united oblong-lanceolate segments, greenish or yellowish white with a dark 2-nerved mid-rib. Stamens inserted near the base; filaments filiform; anthers versatile. Ovules 8 to 10 in each cell; style clavate, persistent and at length splitting. Capsule globose, scarcely lobed, loculicidal. Seeds compressed and angled. (Anagram of *Allium*.)

1. **M. maritima** Wats. Scapes 3 to 9 in. high, equaled by the narrow ($\frac{1}{2}$ to 1 line wide) leaves; umbels 4 to 12-flowered, the pedicels unequal, 2 to 10 lines long; perianth-segments 2 or 3 lines long; capsule 3 lines long.

Low alkaline fields: Sacramento Valley to Monterey.

9. **ALLIUM** L. WILD ONION.

Herbage with the characteristic taste and odor of onions. Scape from a tunicated or sometimes rhizome-like bulb or from a corm, with radical leaves, and bearing an umbel or head of flowers subtended by 2 or 3 thin whitish or scarious bracts. Leaves narrow and plane, or convolute-filiform. Perianth of 6 distinct or nearly distinct equal segments, campanulate or spreading. Stamens inserted on the base of the segments; filaments often dilated below; anthers versatile. Style filiform, persistent. Capsule obovate or globose, obtusely 3-lobed, often crested; seeds 1 or 2 in each cell, black, wrinkled. (Ancient Latin name of garlic.)

A. Plants with corms.

Scape terete, arising laterally from a corm which propagates by bulb-bearing offshoots. Scape 3 or 4 in. high (?); perianth-segments twice longer than the stamens.....

Scape 1 to 2 ft. high; perianth-segments $\frac{1}{3}$ longer than the stamens.....2. *A. unifolium*.

B. Plants with bulbs.

Scape much flattened and two-edged, from a tunicated bulb; leaves 2, broadly linear, falcate.

Perianth-segments spreading at tip, nearly twice as long as the stamens.....

Perianth-segments nearly erect, only $\frac{1}{2}$ longer than the stamens.....4. *A. breweri*.

Scape terete, arising vertically from a tunicated bulb; leaves narrowly linear, several.

Perianth rose-color.

Ovary-cells with an obscure thickened ridge on each side toward the summit; montane.....5. *A. lacunosum*.

Ovary-cells with 2 very narrow central crests; low hills.....6. *A. serratum*.

Perianth white or light pink; leaves convolute-filiform.....7. *A. attenuifolium*.

1. ***A. bolanderi*** Wats. Corms sometimes clustered, oblique, the coats with an obscure delicate close undulate-serrate reticulation; scape lateral, very slender; pedicels 10 to 17, slender, 5 to 10 lines long; bracts 2, 7 or 8 lines long, ovate-lanceolate, acuminate; flowers rose-color or pinkish, the very narrowly acuminate segments nearly straight, 4 or 5 lines long, twice longer than the stamens and style; filaments filiform, adnate to the middle.

Humboldt Co., first collected by Bolander.

2. ***A. unifolium*** Kell. Corm deeply seated, bearing a short, horizontal root-stock which gives rise to an erect scape; leaves 2 to 4, sheathing the scape below the ground, flattish, 2 to 4 lines wide, shorter than the scape; bracts 2, large, acuminate; umbels 10 to 30-flowered, the pedicels 1 to $1\frac{1}{2}$ in. long; flowers rose-color; segments broadly oblong-lanceolate, 5 to 7 lines long, $\frac{1}{3}$ longer than the stamens and styles.

Monterey Co.; Mt. Diablo; Napa Mts.; Ukiah. The bulb was used as a food by the Pomo Indians.

3. ***A. falcifolium*** H. & A. Bulb-coats not reticulated; scape 2 to 3 or 4 in. high, 1 to 3 lines broad; leaves 3 to 5 lines broad; flowers rose-color, the lanceolate segments attenuate and spreading above, very minutely glandular-serrate, 4 to 7 lines long, nearly twice longer than the stamens and style; capsule acute, with 3 short narrow central crests.

Napa Mts. and northerly to Lake Co.

4. ***A. breweri*** Wats. Bulbs large, 6 to 9 lines in diameter, the coats without reticulation; scapes 1 or 2 in. high; leaves 3 to 5 lines broad; bracts acute; pedicels 4 lines long; flowers deep rose-color, the lanceolate acute segments nearly erect, 5 to 6 lines long, a third longer than the stamens; ovary and capsule with a thick, slightly lobed crest upon each cell.

Mt. Hamilton (R. L. Pendleton); Mt. Diablo; Pope Valley.

5. **A. lacunosum** Wats. Scape 3 to 6 in. high; bulb-coats light colored, thick and distinctly pitted by the quadrate or transversely oblong reticulation, the outline of the cells very minutely sinuous; umbels 10 to 20-flowered, the pedicels 3 to 5 lines long; bracts broadly ovate, tipped with a slender-subulate point; flowers small (3 lines long); perianth-segments oblong-lanceolate, or oblong, acute, a little exceeding the stamens; filaments narrowly deltoid below; ovary-cells with an obtuse thickened ridge toward the summit on each side.

Mariposa Peak, Santa Clara Co., *Brewer*; Mt. Hamilton, *R. L. Pendleton*.

6. **A. serratum** Wats. Bulb-coats with a distinct close horizontally serrate reticulation; bracts narrowly acuminate; perianth-segments pink, broadly ovate-lanceolate, 4 to 6 lines long, acute or somewhat acuminate, nearly straight and rather rigid, the inner narrower, somewhat shorter and rarely serrulate; filaments all with a narrowly deltoid base; crests very narrow, central.

Low hills.

7. **A. attenuifolium** Kell. Bulb-coats commonly reddish, with a delicate transversely sinuate or serrate reticulation, the vertical lines especially also minutely sinuous; scape slender, 6 to 13 in. high; leaves narrow and becoming convolute-filiform above the sheathing base; bracts 2, short, abruptly acute; umbel erect, usually dense; pedicels 25 to 35, 3 to 8 lines long; flowers white or nearly so, the oblanceolate acuminate segments 3 or 4 lines long, more or less exceeding the stamens and style.

North Coast Ranges and Sierra Nevada. Var. *MONOSPERMUM* Jepson. Scapes in clusters of 2 to 4; bracts 3; capsule by abortion 1-celled and 1-seeded.—Vaca Mts.

10. CAMASSIA Lindl.

Acaulescent plants with linear leaves, slender scapes from a tunicated bulb, and dark blue or nearly white flowers in a simple raceme. Bracts scarious. Pedicels jointed at the summit. Perianth-segments 6, distinct, oblanceolate, somewhat spreading. Stamens 6, on the base of the perianth, shorter than the segments; anthers versatile. Style filiform, slightly 3-cleft at apex, the lower part persistent. Capsule 3-lobed, loculicidally 3-valved. Seeds several in each cell. (Quamash or camass, the name of the northwest Indians.)

1. **C. esculenta** Lindl. *CAMASS.* Scape stoutish, 1 to 2½ ft. high; flowers blue; perianth-segments unequal, spreading irregularly in 2 sets of 3 each, nearly 1 in. long, not twisted over the obtusely angled capsule.

Wet meadows, Santa Rosa and Napa valleys and northward to Washington.

C. LEICHTLINII Wats. Flowers dark blue to white; perianth-segments spreading regularly in a perfect star, withering over the capsule like a bon-bon, at length deciduous as a whole; capsule oblong-obovate, slightly notched at apex.—Red Mt. near Ukiah, *Purdy*, and northward to Washington.

11. CHLOROGALUM Kunth.

Stem from a tunicated bulb, tall, almost leafless, branching above into a spreading panicle, the branches racemose and sparingly branched or simple. Leaves of the radical tuft long-linear, those of the stems very much reduced. Bracts small and scarious. Pedicels jointed at the summit. Perianth white or pinkish, persistent and at length twisted over the ovary; segments 6, distinct, spreading, ribbon-like, with 3 distinct but closely approximate nerves down the middle. Stamens 6, rather shorter than the segments and inserted on their

bases; anthers versatile. Style long-filiform, slightly 3-cleft at apex. Capsule broadly turbinate, 3-lobed, loculicidal, with 1 or 2 seeds in each cell. (Greek chloros, green, and gala, milk or juice.)

Perianth-segments rotate-spreading; pedicels 3 lines long or more; bulb with a thick coat of coarse fibers.....1. *C. pomeridianum*.
Perianth-segments somewhat spreading from above the base; pedicels 1 line long or less; bulb with a membranous coat.....2. *C. angustifolium*.

1. *C. pomeridianum* Kunth. SOAP PLANT. AMOLE. Plants 2 to 5 ft. high; bulbs 4 in. long and 2 in. thick with a very dense coat of coarse brown fibers; radical leaves numerous, $\frac{3}{4}$ to $2\frac{1}{2}$ ft. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. broad, carinate and with strongly undulate margin; cauline leaves few, short and long-attenuate; pedicels slender, about 3 lines long; perianth-segments linear, 8 to 10 lines long, white, purple-veined, spreading widely; capsule 3 lines long, the valves pinnately nerved.

Dry open low hills and plains throughout California. July-Aug. The flowers open only in the afternoon, whence the specific name. Bulbs employed by the Indians and Spanish-Californians for washing garments and used as food by the Pomos, as doubtless other tribes, who cooked them in great pits in the ground with California Grape leaves intermixed.

2. *C. angustifolium* Kell. Bulb with a membranous coat; leaves 4 to 7 in. long, 2 or 3 lines broad, becoming revolute; plant 14 to 22 in. high, the panicle with few ascending branches; flowers white with yellowish-green lines, 5 lines long; pedicels 1 line long or less, equaling the bracts or a trifle shorter; perianth funnelform-campanulate, its segments narrowly oblong; ovary on a short stipe.

Lower San Joaquin and northward.

12. ZYGADENUS Michx. ZYGADENE.

Stem simple, scape-like, in ours from a tunicated bulb. Herbage glabrous and somewhat glaucous. Leaves linear, mostly radical. Flowers erect, greenish-white, rather large, in a raceme or panicle. Perianth nearly rotate, withering-persistent; segment ovate to oblong-lanceolate, with a green glandular spot at the narrow but scarcely clawed base. Stamens 6, free from the segments and about equaling them. Styles distinct, persistent. Capsule deeply 3-lobed. (Greek zugon, a yoke, and aden, a gland.)

Stamens $\frac{1}{2}$ as long as the perianth; only inner segments contracted to a broad claw....

1. *Z. fremontii*.
Stamens equaling the perianth; segments all contracted to a short claw.....

2. *Z. venenosus*.

1. *Z. fremontii* Torr. STAR ZYGADENE. Plants $1\frac{1}{4}$ to $2\frac{1}{4}$ ft. high; bulb globose or broadly oblong, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, with dark coats; radical leaves 8 to 20 in. long, 5 to 9 lines broad, usually somewhat falcate-curving, the cauline few and shorter; raceme simple or paniculate; perianth-segments 3 to 7 lines long, the outer not clawed, the inner contracted to a broad claw; gland greenish yellow, toothed on its upper margin; stamens about half as long as the segments; ovules 10 to 20 or more in each cell; capsule oblong, 6 to 10 lines long.

Coast Range hillsides among bushes, common and variable. Apr.-June. Indians regard the bulbs as poisonous. Also called Black Grass Nut. Var. MINOR H. & A., 4 or 5 in. high, with few flowers.—An early form near the coast.

2. **Z. venenosus** Wats. DEATH CAMAS. Plants $1\frac{1}{2}$ to 2 ft. high; bulb oblong-ovate, about 4 to 6 lines in diameter; leaves narrowly linear, 1 to $2\frac{1}{4}$ lines broad, carinate and usually folded, scabrous on the margin; raceme commonly simple and narrow, 3 to 5 or 10 in. long, the bracts setaceous-acuminate; perianth-segments triangular-ovate to elliptical, 2 or 3 lines long, abruptly contracted to a short claw; gland irregular on its upper side but not toothed; stamens nearly equaling the segments; ovules 6 to 8 in each cell; capsules on erect pedicels, often contracted at apex.

Meadows near the coast from Monterey northward; Sierra Nevada. Very poisonous, especially to sheep. Hogs seem immune, whence "Hog's Potato."

13. VERATRUM L. FALSE HELLEBORE

Stems tall and leafy from short thick rootstocks, bearing coarse fibrous roots. Leaves broad, plaited, coarsely nerved. Stem and inflorescence pubescent. Flowers polygamous, greenish or cream-color, in a terminal panicle. Perianth of 6 distinct obovate-oblong segments, somewhat contracted at the base, adnate to the base of the ovary. Stamens 6, opposite the perianth-segments and free from them, shorter by half and recurving; filaments subulate; anthers with confluent cells, cordate. Styles 3, persistent, mostly curved. Capsule 3-celled, 3-lobed. (Latin vere, truly, and ater, black, in reference to the color of the roots.)

Perianth-segments oblong-obovate or oblanceolate, entire or merely denticulate near the apex; capsule oblong-ovoid, about 1 in. long.....1. *V. californicum*.
Perianth-segments rhombic-ovate, deeply fringed except at the base; capsule depressed-globose with notched apex, 4 lines long.....2. *V. fimbriatum*.

1. **V. californicum** Durand. Stem very stout and leafy, suggesting a corn-stalk, 3 to 5 or 6 ft. high; leaves ovate or elliptic-oblong, sheathing at base, 6 to 12 in. long or the uppermost lanceolate and shorter; panicle 1 to $1\frac{1}{2}$ ft. long, the lower portion often sterile; pedicels 1 to 4 lines long; perianth-segments 7 or 8-nerved, 4 to 9 lines long, with a thickened greenish margin toward the base, the margin near the apex often somewhat denticulate or erose; stamens 3 or 4 lines long; capsule $\frac{7}{8}$ to $1\frac{1}{4}$ in. long.

Wet meadows and about springs, a characteristic plant of the Sierra Nevada at 5000 to 6000 ft.; also in the high North Coast Ranges. Often reported as poisonous to stock.

2. **V. fimbriatum** Gray. Similar in habit to the preceding; leaves very long and narrow, 7 to 19 in. long and about 2 in. wide; panicle 7 to 12 in. long, its branches widely spreading; pedicels 4 lines long; perianth-segments rhombic-ovate, 2 to 5 lines long, the margin cleft into filiform segments, except at the broad base which bears two oblong more or less glandular spots reaching to the middle of the segment and separated by a furrow; filaments 2 lines long; styles long and slender; capsule depressed or globose and somewhat notched at apex, 4 lines long, the walls membranous; seed scarcely margined.

Mendocino "White Plains" and northward.

14. XEROPHYLLUM Michx.

Perennials with a thick and short woody rootstock bearing cord-like roots. Radical leaves sedge-like in a dense tuft, numerous, elongated and very narrowly linear, dry, serrulate. Stem simple, stout and leafy, bearing a many-flowered raceme; pedicels slender, white. Perianth white or cream-colored, of 6 distinct several-nerved persistent segments. Stamens 6, with rounded extrorse anthers. Ovary 3-lobed; styles 3, distinct. Capsule chartaceous, loculicidal, or

in some cases also septicial. Seeds 2 to 4 in each cell. (Greek xeros, dry, and phullon, leaf, the foliage very hard and dry.)

1. **X. tenax** (Pursh) Nutt. BEAR GRASS. Stem $2\frac{1}{4}$ to 6 ft. high, exceeding the radical leaves which are 1 to 3 lines wide; raceme dense, $\frac{3}{4}$ to 1 ft. long or more; pedicels 1 to 2 in. long, each with a scarious bract at base $\frac{1}{2}$ as long, or the lowermost bracts foliaceous and exceeding the pedicels; perianth-segments linear-oblong, 4 lines long, the filaments a little longer; capsule broadly ovate, acute, almost 3 lines long, loculicidally 3-valved.

Monterey and northward in Coast Ranges to Del Norte Co. where it is very common; northern Sierra Nevada. Said to bloom only once in 5 or 7 years (Erythea, vi, 74). June. Pedicels in flower spreading, past anthesis strictly erect; as the fruit matures they bend outward and the capsule is on a divergent pedicel. The fibres of the leaves were employed by the Hupas for making garments and for decorative work in baskets, while the bulbs furnished a nourishing food after being roasted in a pit for two days.

15. **NARTHECIUM** Moeh. BOG ASPHODEL.

Leaves narrowly linear and equitant, mostly radical, borne on a creeping rootstock. Stems rather scape-like with few radical leaves, bearing a terminal raceme of yellowish-green flowers. Pedicels with a bractlet at the middle. Perianth with 6 distinct segments. Stamens 6, the filaments densely woolly, except at the very base. Style 1, attenuate upward to the stigma which is scarcely or very slightly lobed. Capsule loculicidal, with thin-chartaceous walls. Seeds numerous with a long bristle-like point at each end. (Narthex, Greek name of Ferula, the stems of which were used as rods; applied here on account of the scape or rod-like flower stems.)

1. **N. californicum** Baker. Leaves iris-like, 4 to 8 in. long, $1\frac{1}{2}$ to 2 lines wide; cauline leaves 2 or 3, 1 to $1\frac{1}{2}$ in. long; stems 18 or 20 in. high; raceme loose, $3\frac{1}{2}$ to $4\frac{1}{2}$ in. long; perianth-segments oblong-linear, acute, 3 or 4 lines long, the inner with scarious margins; ripe capsules salmon-color; seeds, including the points or tails, 5 lines long.

Mendocino Co. and northward; northern Sierra Nevada.

16. **TRILLIUM** L. WAKE ROBIN.

Stem simple, from a tuberous rootstock, naked below and bearing at the summit a whorl of 3 round-ovate netted-veined leaves and a single large flower. Perianth of 3 lanceolate herbaceous persistent sepals and 3 larger marcescent petals. Stamens 6, much shorter than the segments; anthers linear, on short filaments, adnate. Ovary 3 to 6-angled, 3-celled or 1-celled at summit. Stigma sessile, elongated, stigmatic down the inside. Fruit a fleshy reddish capsule. Seeds ovate. (Latin triplum, triple, on account of the 3-merous flowers.)

Flower sessile 1. *T. sessile*.
Flower raised on a peduncle 2. *T. ovatum*.

1. **T. sessile** L. var. **giganteum** H. & A. COMMON TRILLIUM. Stem stout, sometimes more than one from the same root, 1 to $1\frac{3}{4}$ ft. high; leaves round-ovate, $3\frac{1}{2}$ to 5 in. long, commonly broader than long; petals narrowly obovate to oblanceolate, $2\frac{1}{2}$ in. long, deep red or lilac, or varying to white; stamens 10 to 12 lines long.

Coast Range woods but not in inner Coast Range. Feb.-Mar. Var. **CHLOROPETALUM** Torr. Petals white, yellowish or greenish.—Pt. Reyes Peninsula. Napa Valley has only the white-flowered form (Mrs. D. O. Hunt). Var.

ANGUSTIPETALUM Torr. Petals narrowly linear.—Sierra Nevada; San Luis Obispo.

2. **T. ovatum** Pursh. COAST TRILLIUM. Stem 8 or 10 in. high; leaves ovate to round, sometimes disposed to be rhombic, abruptly acute, $2\frac{1}{2}$ to $5\frac{1}{2}$ in. long; peduncle erect; petals oblong-lanceolate to ovate, 1 to $1\frac{1}{2}$ in. long, white changing to deep rose-color; sepals of about the same shape and size or narrower; stamens 3 to 6 lines long; capsule broadly ovate, the angles projected into narrow wings.

Woods near the coast: Santa Cruz to Mt. Tamalpais, Napa Valley and northward. Mar.-Apr.

17. SCOLIOPUS Torr.

Acaulescent, the very short subterranean stem bearing a pair of broad leaves and an umbel of greenish purple flowers, the peduncle of which is almost obsolete, the sharply angular pedicels (which look like scapes) alone appearing above ground. Perianth-segments narrow. Stamens 3, opposite the sepals, short, with greenish extrorse anthers. Ovary 1-celled; style short, its 3 long branches abruptly spreading horizontally, or the tip recurving. Capsule with a membranous wall which bursts irregularly. (Greek skolios, crooked, and pous, foot, in allusion to the tortuous pedicels.)

1. **S. bigelovii** Torr. Leaves elliptic to oblong, commonly mottled with dark splotches, 4 to 8 in. long, sheathing at base; flowers with a fetid odor and having something the appearance of orchids; pedicels 4 to 9 in. long, 3-angled, slightly winged, erect in fruit, tortuous recurving or procumbent, the maturing capsule more or less hidden by forest litter; sepals ovate-lanceolate, 7 to 9 lines long, with 10 or 12 black veins, somewhat carinate toward the base, the upper $\frac{3}{4}$ abruptly spreading or recurved; petals linear-subulate, as long as the sepals, hardly 1 line wide, ascending at base and with their long points convergent, forming an arch above the pistil; stamens $2\frac{1}{2}$ or 3 lines long.

Shade of the Redwood forest, Marin to Humboldt. Jan.-Mar.

18. CLINTONIA Raf.

Apparently acaulescent, the stem from a creeping rootstock, very short and bearing at or from beneath the ground few broad leaves and a scape-like peduncle. Flowers few to many in a terminal umbel or with 1 to several small supplementary clusters scattered along the peduncle. Perianth resembling a very small lily flower, campanulate, of 6 distinct deciduous segments. Stamens 6, with filiform filaments, inserted on the base of the segments; anthers fixed just above the base, extrorse. Ovary 2 to 3-celled; ovules 2 to 3 in each cell; style slender, slightly 2 to 3-lobed, deciduous. Fruit a smooth ovoid berry. (De Witt Clinton of New York.)

1. **C. andrewsiana** Torr. Leaves commonly 5, sometimes 6, narrowly or broadly oblong, rather abruptly short-pointed, 7 to 13 in. long, 2 to $4\frac{1}{2}$ in. broad; peduncle 15 to 20 in. high, bearing a terminal umbel of many flowers and with 2 to 4 supplementary clusters borne laterally, the lateral clusters 1 to 9-flowered or rarely none; flowers 5 to 8 lines long, rose-red or pink; filaments slightly pubescent below the middle; fruit indigo blue.

Shady woods near the coast: Santa Cruz Mts. to Cazadero, Westport and Humboldt Co. The berries suggest small-sized old fashioned blueing balls.

C. UNIFLORA Kunth. Bride's Bonnet. Flowers 1 or 2, white, $\frac{3}{4}$ in. long.—Sierra Nevada.

19. **MAIANTHEMUM** Wigg.

Stem low, from a horizontal rootstock, bearing 2 or 3 broad leaves and white flowers in a terminal raceme, the pedicels solitary or 2 or 3 in a cluster. Perianth-segments 4. Stamens 4, with filiform filaments. Ovary 2-celled; stigma 2-lobed. Fruit a red globose berry. (Greek maios, May, and anthemion, flower, in allusion to the flowering period.)

1. **M. bifolium** DC. var. **kamtschaticum** Jepson, n. comb. Stems simple, erect, 4 to 14 in. high, often stout; leaves ovate or triangular-cordate, $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long, the petiole of the lower one sometimes longer than the blade; radical leaf cordate, short-pointed, very large, very long-petioled, almost as tall as the flowering stem; raceme peduncled, $\frac{1}{2}$ to 2 in. long; pedicels 1 to 2 lines long; perianth-segments oblong or broadest toward apex, slightly unequal, 1 to $1\frac{1}{2}$ lines long, becoming deflexed; berry 3 lines in diameter.—(*Convallaria bifolia* var. *kamtschatica* Gmel. *M. bifolium* var. *dilatatum* Wood.)

Sausalito hills, in rocks ("only locality known to me in Bay region," Mrs. K. Brandegee); Eureka and far northward. The leaves furnish a lotion for inflammation and burns highly esteemed in rural medicine.

20. **SMILACINA** Desf. FALSE SOLOMON'S SEAL.

Stems simple and leafy, from horizontal rootstocks, bearing a terminal raceme or panicle of small white flowers with minute bracts. Leaves sessile, many-nerved. Pedicels jointed at the summit. Perianth persistent, the segments distinct and spreading. Stamens with subulate filaments inserted at the base of the segments; anthers versatile. Style 3-lobed at the summit, persistent; ovules 2 in each cell. Fruit a globose 1 to 3-seeded berry. Seeds subglobose, with thin testa and horny albumen. (Diminutive of *smilax*.)

Flowers in a simple raceme; stamens $\frac{1}{2}$ to $\frac{3}{4}$ as long as the perianth-segments, filaments not dilated.....1. *S. sessilifolia*.
Flowers in a panicle; filaments broad, much longer than the perianth-segments.....2. *S. amplexicaulis*.

1. **S. sessilifolia** Nutt. Rootstock slender; stem 1 to 2 ft. high, usually flexuous above; leaves ovate or oblong-lanceolate, 2 to 6 in. long, acute or acuminate, sessile and clasping, more or less puberulent; raceme open, sessile or shortly peduncled, the spreading solitary pedicels 2 to 7 lines long; perianth-segments $1\frac{1}{2}$ to 4 lines long, lanceolate, becoming reflexed, the stamens $\frac{1}{2}$ to $\frac{3}{4}$ as long; style nearly equaling the ovary; berry red-purple or nearly black, globose, 3 to 5 lines in diameter, 1 to 4-seeded.

Shady woods of the Coast Ranges from Monterey Co. to Oakland, the Napa Range and westward to the ocean, and northward. Mar.-Apr.

2. **S. amplexicaulis** Nutt. Rootstock stout, elongated; stem 1 to 3 ft. high, this and the under surface of the leaves with a minute fuzzy pubescence or rarely glabrous; leaves oblong-ovate to lanceolate, 3 to 5 in. long, acute at apex, sessile by a broad clasping base; panicle usually short peduncled, oblong, 2 to 4 in. long; pedicels 1 line long or less; perianth-segments less than 1 line long; filaments lanceolate or broadly subulate, much longer and often broader than the segments; style very short; berry light red, very finely sprinkled with dark red dots, 2 to $2\frac{1}{2}$ lines in diameter, usually 1-seeded.

Shady woods, range of preceding but also in the Sierra Nevada. Apr.

21. **DISPORUM** Salisb. FAIRY BELLS.

Rootstocks short, horizontal, bearing fibrous roots and giving rise each

year by a terminal bud to an erect stem, which is branched above and leafy. Leaves sessile, ovate, thin, transversely-veined between the primary nerves. Flowers greenish or white, drooping on a terminal peduncle, solitary or few in an umbel. Perianth campanulate, deciduous. Filaments attached within the anthers, above the base. Fruit a berry. (Greek di, two, and spora, seed, some species with two seeds in each ovary cell.)

Flowers greenish, $\frac{1}{2}$ in. long; style glabrous, entire; leaves mostly cordate at base.....

Flowers whitish, $\frac{3}{4}$ to 1 in. long; style densely short-hairy, slightly 3-cleft at apex; leaves mostly rounded or subcordate at base.....

1. *D. hookeri*.

2. *D. menziesii*.

1. *D. hookeri* (Torr.) Britton. FAIRY BELLS. Roughish pubescent, 1 to $2\frac{1}{4}$ ft. high; leaves ovate, cordate at base, abruptly acute or attenuate, $1\frac{1}{2}$ to 3 in. long, the uppermost somewhat oblique; perianth green, narrowly campanulate, 5 to 6 lines long, the tips of the segments spreading; stamens equaling or exceeding the perianth; berry obovate, obtuse, scarlet.—(Prosartes hookeri Torr.)

Shady woods of the Coast Ranges: Santa Cruz Mts.; Oakland Hills; Mt. Diablo; Marin Co.; Glen Ellen; Napa Range.

2. *D. menziesii* (Don.) Britton. FAIRY LANTERN. Soft-pubescent or almost glabrous; stems 1 to 3 ft. high; leaves ovate, or sometimes round-ovate to ovate-lanceolate, rounded or subcordate (and often a little oblique) at base, at apex acuminate-attenuate, 2 to 4 in. long; perianth whitish, broad and cup-shaped at base, $\frac{3}{4}$ to 1 in. long, the tips of the segments erect; stamens $\frac{1}{3}$ shorter than the perianth; style densely short-hairy, except at the very base, slightly 3-cleft at apex; fruit yellow, oblong-obovate, attenuate above into a short beak, $\frac{1}{2}$ in. long.—(Prosartes menziesii Don.)

Stream banks, Coast Range woods: San Mateo Co. to Mt. Tamalpais, Inverness, and Westport; north to British Columbia.

22. ASPARAGUS L.

Stems from rootstocks, very much branched and with filiform branchlets clustered in the axils of the scaly leaves. Flowers small, solitary or in umbels or racemes. Perianth-segments alike, distinct or slightly united, the stamens inserted on their bases. Ovary 3-celled, with 2 ovules in each cell; style short, stigmas 3, recurved. Fruit a globose berry. (Ancient Greek name.)

1. *A. officinalis* L. ASPARAGUS. Stems tall and branching, 3 to 5 ft. high, when young stout, succulent and edible; clustered branchlets 4 to 8 lines long; flowers green, pendulous on jointed peduncles; perianth campanulate, 3 lines long, with included stamens; berry red, 4 lines in diameter.

Garden plant escaped to low lands about Alameda.

IRIDACEAE. IRIS FAMILY.

Perennial herbs, ours low, with stout stems and 2-ranked sword-like and sheathing leaves. Inflorescence terminal. Flowers perfect, with petal-like perianth of 6 divisions in 2 whorls. Stamens on the base of the outer whorl, with extrorse anthers. Ovary inferior, 3-lobed, becoming a 3-celled capsule.

Stems terete; divisions of the perianth in two unlike whorls.....1. IRIS.
Stems 2-edged or -winged; divisions of the perianth alike.....2. SISYRINCHIUM.

1. IRIS L. FLAG.

Stems terete, from creeping stout rootstocks. Flowers in the axils of spathaceous bracts. Perianth-tube prolonged beyond the ovary; outer seg-

ments or sepals obovate above the claw, spreading or recurved; inner segments or petals narrower, erect. Style divided into 3 petal-like branches, each branch with 2 lobes or appendages at summit; stigma a small projecting shelf (stigmatic only on the upper surface) situated on the lower surface of the branch just below the lobes or appendages. Stamens with linear anthers lying close beneath the branches of the style, *i. e.*, opposite them. Capsule oblong, 3-angled. Seeds flattened or turgid, in 2 rows in each cell. (Greek iris, the rainbow, the Greek species of the genus being celebrated for its brilliant colors. *I. hartwegii* Baker, of the Sierra Nevada in the Sugar Pine belt, may be known by its separate often distant bracts, leafy stems and India-yellow flowers; the following species have the bracts of the spathe closely approximate.)

Flowers 3 to 5 in a cluster, pale violet or the sepals white, veined with purple; perianth-tube 3 lines long.....1. *I. longipetala*.
Flowers 2 or 3 in a cluster, cream-color or azure; perianth-tube 6 to 12 lines long.....2. *I. douglasiana*.

Flowers 1 or 2 in a cluster, violet; perianth-tube $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long....3. *I. macrosiphon*.

1. *I. longipetala* Herbert. Leaves 10 to 22 in. long, 4 to 6 lines broad, equaling or rather exceeding the flower-peduncles; pedicels $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; bracts scarious at apex, $2\frac{1}{2}$ to 4 in. long, $\frac{3}{4}$ to $1\frac{1}{8}$ in. broad (when spread out); sepals white, veined with violet or violet above, 3 in. long, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. broad, narrowed to a short claw, the claw with a very prominent ventral ridge which disappears in the middle of the blade; petals light violet, $2\frac{3}{4}$ in. long, 6 or 7 lines wide; anthers 8 lines long; lobes above the stigma broader and more obtuse than in no. 3, more evidently overlapping; capsule narrowed at each end, 2 in. long.

Pt. Isabel (Contra Costa Co.) and about San Francisco, where it is very common; thence southward to Monterey.

2. *I. douglasiana* Herbert. Stem $1\frac{1}{4}$ to 2 ft. high, much exceeded by the (4 to $6\frac{1}{2}$ lines wide) radical leaves; bracts broader and less acuminate than in the next; flowers 2 or 3 in a pair of bracts, mostly cream-color or azure; the pedicels 1 in. long; perianth-tube 6 to 12 lines long; sepals 2 in. long or more; capsule narrowly oblong, $1\frac{3}{4}$ to 2 in. long.

Common in the Coast Ranges from the Vaca Mts. and Mendocino Co. southward to San Mateo Co. May-June. The color of the flowers is exceedingly variable, but the species may be known from the next by its long pedicels, shorter perianth-tube and stouter habit.

3. *I. macrosiphon* Torr. GROUND IRIS. Stems low and slender, much shorter than the leaves which are 5 to 10 in. long and 2 lines broad; bracts lanceolate, long acuminate, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long; flowers 1 or 2, very shortly pediceled, with slender tube $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long; perianth violet-purple; sepals oblong-obovate, their lower or middle portion blotched or veined with white, the margin above often undulate, about $1\frac{3}{4}$ in. long; petals oblanceolate, of a uniform color; anthers 6 lines long; capsule about 1 in. long.

San Mateo and Marin cos. northward. Apr. "For nets and snares the Hupas make twine and rope from the leaves" (P. E. Goddard).

2. SISYRINCHIUM L. BLUE-EYED GRASS.

Glabrous plants. Stems slender, 2-edged or winged, often geniculate, from fibrous roots, with grass-like or lanceolate leaves and fugacious, relatively small flowers in umbels enclosed by 2 sheathing herbaceous bracts, with a scarious bractlet subtending each pedicel. Perianth 6-parted, the divisions alike, spreading. Stamens monadelphous, their anthers alternate with the branches

of the style; stigmas thread-like. (Name of Theophrastus for a bulbous plant allied to Iris.)

Flowers purplish blue; filaments united to the top.....1. *S. bellum*.
Flowers yellow; filaments united only at base.....2. *S. californicum*.

1. ***S. bellum*** Wats. BLUE-EYED GRASS. NIGGER-BABIES. Erect, 10 to 15 in. high, the stems somewhat branching; leaves shorter than the stem, 1 to 2½ lines wide; bracts 1 in. long, enclosing about 7 flowers; perianth purplish blue, segments oblong-obovate, conspicuously 4 to 6-nerved, emarginate at apex, with a slender tooth in the notch, 7 lines long, the inner narrower; anthers short-sagittate; style terminated by an abruptly thickened or obelavate structure, the attenuate portion being divided into 3 short stigmas; capsule globose, 2 to 3 lines long; seed obscurely pitted.

Very common throughout California. Mar.-Apr. Called "Azulea" and "Vilella" by Spanish-Californians.

2. ***S. californicum*** Ker. GOLDEN-EYED GRASS. About the size of the last but the stems unbranched and the leaves somewhat broader; bracts rather unequal, enclosing 3 to 7 flowers; perianth bright yellow; segments 4 to 6 lines long, 5 to 7-nerved, obtuse or acutish; anthers 1½ lines long, about equaling the filaments; style cleft below the middle; capsule obovate-oblong, 4 lines long.

Wet places near the coast from San Diego northward beyond California. Apr.

ORCHIDACEAE. ORCHID FAMILY.

Perennial herbs with corms, bulbs, tuberous roots or rootstocks and sheathing leaves often reduced to scales. Flowers perfect, irregular, bracted, either solitary or in spikes or racemes. Sepals 3, alike. Petals 3, 2 alike; the third petal called the "lip" commonly dissimilar in color, size and shape, often enlarged, sac-like or spurred, in our genera most frequently brought into an inferior position (*i. e.*, on the lower side of the flower), by twisting of the ovary. Filaments united with the single style forming a column, anther 1 (in *Cypripedium* 2), situated on the apex of the column and just above or behind the stigma, which is a viscid surface facing the lip. Pollen agglutinated into 2 to 8 pear-shaped masses. Ovary inferior, commonly long and twisted, 1-celled. Fruit a 3-valved capsule. Seeds innumerable, minute.

Plants with green herbage.

Flowers few and showy; lip an inflated sac; stem leafy.....1. *CYPRIPEDIUM*.
Flowers in spikes or racemes.

Perianth with a spur.....2. *HABENARIA*.
Perianth spurless.

Stem leafy.

Raceme loose with foliaceous bracts; flowers greenish or rose-color.....
3. *EPIPACTIS*.

Spike dense and twisted; flowers white.....4. *SPIRANTHES*.

Stem scape-like, the leaves in a radical cluster; flowers white.....5. *GOODYERA*.

Flower solitary, showy; lip sac-like; leaf 1, basal.....6. *CALYPSO*.

Plants reddish brown, destitute of green herbage and the leaves reduced and scale-like....
7. *CORALLORHIZA*.

1. *CYPRIPEDIUM* L. LADY'S SLIPPER.

Stems leafy from tufted fibrous roots. Leaves large. Flowers few or solitary, large and showy, leafy bracted. Sepals spreading, in ours seeming as if only 2, the lateral completely or almost completely united into one under the lip, which is an inflated sac with the incurved margin auricled near the base. Column very short, incurved, terminating in a disk-like stigma. Fertile

anthers 2, on short filaments, one on each side of the column below the stigma; sterile anther conspicuous, roundish or ovate, situated on the upper side and over-arching the stigma. (Latin Cypris, Venus, and pes, a foot, the saccate lip a fit buskin for the goddess.)

1. *C. montanum* Dougl. Rough-pubescent with short glandular hairs, 1 to 2 ft. high; leaves elliptic to narrowly-ovate, the largest 5 or 6 in. long and 3 in. broad; flowers 1 to 3, shortly pediceled; sepals and wavy-twisted petals linear-lanceolate, $1\frac{1}{2}$ to 2 in. long; lower sepals united almost to the apex, only the lanceolate-subulate tips free; upper petals elongated; lip 1 in. long, dull white, veined with purple; sterile anther ovate, 4 lines long, on a slender filament; capsule erect or nearly so, oblong, 10 lines long.

Woods, rare in our district and only near the coast: Coast Ranges from the Santa Cruz Mts. northward; Sierra Nevada.

C. CALIFORNICUM Gray of Mendocino Co. and the northern Sierra Nevada has 3 to 6 flowers; sepals oblong, 6 to 7 lines long, the lower united to the apex; upper petals linear, short; sterile anther rounded, nearly sessile.

2. HABENARIA Willd. REIN-ORCHIS.

Stems erect, leafy at least at base, solitary from fleshy tuber-like roots. Flowers greenish, yellowish, or white, in a terminal spike or raceme. Sepals equal, the lateral mostly spreading, the petals a trifle smaller. Lip spreading or drooping, in ours entire, produced at base into a long slender spur. Column very short. Anther-sacs more or less divergent. (Latin habena, a thong or rein of a horse, on account of the shape of the spur in some species.)

Flowers greenish; dry hills.

- | | |
|---|-----------------------------|
| Lip ligulate; stems slender, naked, with 2 leaves at base..... | 1. <i>H. elegans</i> . |
| Lip triangular-ovate; stems cylindrical, leafy at base and with scale-like leaves above | 2. <i>H. michaelii</i> . |
| Flowers white or whitish, fragrant. | |
| Stem leafy; lip slender-lanceolate above the roundish base, much exceeding the sepals and petals; moist places..... | 3. <i>H. leucostachys</i> . |
| Stem leafy at base, scaly above; lip narrowly ovate, not exceeding the sepals or petals | 4. <i>H. maritima</i> . |

1. *H. elegans* Bolander. WOOD REIN-ORCHIS. Stem slender, 10 to 20 in. high, with 2 (or sometimes 3) leaves at base; leaves lanceolate or oblong-lanceolate, acuminate, 4 to 6 in. long, drying up or quite gone by flowering time; spike slender, rather dense but not crowded, 4 to 7 in. long; flowers small, light-green; bracts broadly subulate, acuminate, equaling the ovary; perianth-segments $1\frac{1}{2}$ to 2 lines long; sepals oblong; petals and lip ligulate; spur filiform, 4 or 5 lines long, equaling or exceeding the ovary; capsule oblong, nearly sessile, 3 or 4 lines long.

Dry Coast Range hillsides under oaks and other trees.

2. *H. michaelii* Greene. Stem very thick and cylindrical, 1 ft. high or less, leafy at base; cauline leaves triangular-ovate, thin, appressed, 4 to 9 lines long; spike rather dense, $2\frac{1}{2}$ to 3 in. long; sepals and petals similar, $1\frac{1}{2}$ to 2 lines long; lip triangular-ovate, of about the same length; spur fully $\frac{1}{3}$ longer than the ovary.

Under oaks: Livermore; San Luis Obispo.

3. *H. leucostachys* Wats. SIERRA REIN-ORCHIS. Stem leafy, 16 to 22 in. high; leaves linear or lanceolate, 3 to 8 lines broad; flowers white, rather large, in a dense or open spike which is 4 to 8 in. long; bracts linear-subulate, exceeding the ovary; sepals oblong or oblong-ovate, 3 or 4-nerved, thin, 2 or 3 lines long; petals lanceolate; lip slender-lanceolate from a roundish-dilated base,

much exceeding the sepals and petals; spur slender, 4 to 6 lines long; beak of the stigma prominent, ovate, more than half the length of the connective; capsule oblong, sessile, 6 to 9 lines long.

Pt. Reyes. Common about springs and in moist meadows in the Sierra Nevada.

4. *H. maritima* Greene. Low and stout, 6 to 10 or 14 in. high; basal leaves oblong, acute, 3 to 6 in. long, $\frac{1}{2}$ to 1 in. wide, the lowest narrowed to a broad petiole; upper cauline leaves reduced, appressed, lanceolate-subulate; spike $1\frac{1}{2}$ to 4 in. long, slightly conical, 7 to 13 lines broad, the flowers white, with a heavy fragrance, closely crowded; sepals broadly oblong, obtuse, with a green midvein, a little exceeding 2 lines; petals 2 lines long, broadest at the base, ligulate-attenuate above; lip narrowly ovate, with a prominent ridge toward the base; spur slender, longer than the ovary; column short and almost beakless.

Sea-cliffs of the San Francisco Peninsula.

3. EPIPACTIS Haller.

Stem leafy from creeping rootstocks. Flowers in racemes with foliaceous bracts. Sepals and petals nearly equal, spreading; lip strongly constricted at the middle, the lower portion deeply concave, the upper portion dilated. Anther 2-celled, sessile behind the broad truncate stigma, on a slender jointed base; the pollen-masses become attached above to the gland capping the small rounded beak of the stigma. Ovaries reflexed at maturity. (Greek epipaktis, a plant of Dioscorides.)

1. *E. gigantea* Dougl. STREAM ORCHIS. Stout, 1 to 3 ft. high, nearly glabrous; leaves ovate below, lanceolate above, acute or acuminate, 3 to 7 in. long; raceme minutely pubescent; flowers 3 to 10, greenish or rose-color, on pedicels 2 lines long; sepals 7 lines long (exceeding the petals), the upper concave and somewhat carinate; petals rose-color, purple-veined, particularly the lip; lower portion of lip with short erect lobes or wings and with many callous tubercles near the base; upper portion ovate-lanceolate, crested or ridged towards the base; capsule oblong.

Moist stream banks in the Coast Ranges and Sierra Nevada. May.

4. SPIRANTHES Rich.

Stems from a cluster of tuberous roots, erect, leafy. Flowers white, spurless, in 1 to 3 rows in a twisted spike. Sepals and petals all narrow, erect, or more or less connivent. Lip sessile or with a short claw, the lower portion embracing the column and bearing a minute-callose protuberance on each side, the upper portion spreading and wavy-crested. Column short, obliquely inserted on the ovary, bearing the stigma on the front and the sessile or short-stalked erect anther on the back. Capsule erect. (Greek speira, spiral, and anthos, flower, in allusion to the twisted inflorescence.)

Perianth 4 to 6 lines long; callosities at base of lip minute.....1. *S. romanzoffiana*.
Perianth 3 lines long; callosities at base of lip nipple-like and pointing downward.....

2. *S. porrifolia*.

1. *S. romanzoffiana* Cham. Glabrous, 5 to 16 in. high; leaves oblong-lanceolate, 3 to 7 in. long, 4 to 8 lines wide; spike dense, 3 in. long, the flowers in 3 ranks; bracts conspicuous, ovate, abruptly subulate-pointed, 5 or 6 lines long; perianth 4 to 6 lines long, curved, the sepals and petals connivent; lip recurved, broader at base, contracted below the narrower rounded summit; callosities smooth, often not obvious.

Wet meadows in the mountains: high Sierra Nevada to Mt. Shasta and southward to Marin Co. and San Francisco.

2. *S. porrifolia* Lindl. Similar in habit to the preceding; stems 1 ft. high or more; flowers smaller and spike narrower; perianth 3 lines long; callous protuberances at base of lip nipple-like and pointing downward.

Marin Co. acc. to Behr; upper Sacramento Valley, east side (Theo. Hartweg.)

5. GOODYERA R. Br. RATTLE-SNAKE PLANTAIN.

Scapes erect, bearing a few sheathing scale-like leaves, a terminal spike, and at base a cluster of petioled white-reticulated leaves. Rootstock creeping, with fleshy roots. Flowers white, similar to *Spiranthes*. Lateral sepals free, the upper one united with the petals into an erect galea. Lip sac-shaped, sessile, entire and without callous thickenings at base. Anther without a lid. (John Goodyer, British botanist.)

1. *G. menziesii* Lindl. Plants 11 to 15 in. high, glandular-pubescent, especially the scapes and inflorescence; leaves thickish, rosulate, oblong-ovate, acute at both ends, reticulated with white or light-colored veins or markings, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long, on petioles $\frac{1}{2}$ to $\frac{3}{4}$ in. long; flowers 3 or 4 lines long; spike about 5 in. long.

Woods near the coast from Marin Co. northward. Sierra Nevada.

6. CALYPSO Salisb.

Low herb with a corm and coral-like roots. Stem scape-like, 1-flowered, sheathed by a few scale-like leaves and with a single petioled leaf at base. Flowers large, showy, terminal, bracted. Sepals and petals similar and equal; lip sac-like, with 2 short spurs below the expanded apex. Column broadly winged, almost oval, concave, and petal-like; anther hemispherical, borne just below the summit, opening by a lid. (The nymph Calypso in Homer.)

1. *C. borealis* Salisb. CALYPSO. Stem 4 or 5 in. high, the sheathing scales 1 to 2 in. long; leaf ovate, cordate or truncate at base, $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long; petioles $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; flower on a drooping pedicel; sepals and petals rose-purple, sometimes pale, linear-lanceolate, 9 lines long; lip as long or slightly longer, ovate-inflated, reddish brown and mottled, the terminal expanded portion with 3 hairy ridges at base running towards the spurs.

Bogs or in leaf-mold in Redwood forests from Mt. Tamalpais along the coast northward to Washington, thence far eastward. Abundant at Cazadero and believed by the country people to be increasing rapidly. Flowers resembling those of the Lady's Slipper. (Cf. *Erythea*, v. 104.)

7. CORALLORHIZA R. Br. CORAL-ROOT.

Brownish or yellowish saprophytes or parasites, destitute of green herbage, and with branching toothed coral-like roots. Stems scape-like, the leaves reduced to scales, and bearing the flowers in a terminal raceme. Perianth-segments oblong or lanceolate, nearly alike, ours 3-nerved. Lateral sepals united at base with the foot of the column, forming a short spur which is adnate to the summit of the ovary. Lip 1 to 3-ridged. Column 2-edged, slightly incurved. Anther terminal, opening by a lid. Pollen masses 4, soft-waxy. Capsules reflexed. (Greek *korallion*, coral, and *rhiza*, root.)

Perianth 3 or 4 lines long, the lateral sepals spurred at base; lip 3-lobed, the middle lobe largest 1. *C. multiflora*.
Perianth 6 lines long; spur none; lip entire 2. *C. bigelovii*.

1. *C. multiflora* Nutt. Stems 8 to 13 in. high; raceme 2 to 4 in. long; flowers whitish, tinged or veined with purple; sepals and petals 3-nerved, 3 or 4 lines long; lateral sepals united at base with the foot of the column forming a short (1 line long) spur which is adnate to the ovary; lip mostly purple, broadly ovate and somewhat convex, 3-lobed by a deep cleft on each side; lateral lobes narrow and acutish; middle lobe large and rounded or notched, with involute or denticulate margin; raceme loose, 3 to 10 in. long; capsule $\frac{3}{4}$ in. long.

Shade of woods in the outer and middle Coast Ranges.

2. *C. bigelovii* Wats. Stems 12 to 15 in. high, with 3 or 4 sheathing leaves; sepals and petals somewhat flesh-colored, striately 3-nerved with purple or reddish brown lines, about 6 lines long; lateral sepals oblique; lip quite entire; base of the column (opposite lip) prominently gibbous over the ovary; capsule 6 to 9 lines long.

Woods: along the coast and in the Sierra Nevada.

DICOTS.

Leaves netted-veined. Stems increasing in diameter by an annual layer of wood inside the bark. Flowers with the parts in 4s or 5s, the perianth commonly differentiated into calyx and corolla, sometimes absent. Embryo with 2 cotyledons.

CHORIPETALAE.

Calyx usually present, sometimes petal-like. Corolla present or absent, when present consisting of distinct or nearly distinct petals.

SAURURACEAE. LIZARD-TAIL FAMILY.

Ours perennial astringent herbs, with nodose scape-like stems and alternate entire petioled leaves. Flowers perfect, bracteate, in a dense terminal spike. Perianth none. Stamens in ours 5 to 8. Ovary 1-celled, with 1 to 5 stigmas. Fruit a capsule or berry.

1. ANEMOPSIS Hook.

Stoloniferous herb with aromatic rootstock and astringent somewhat spicy herbage. Leaves mostly radical. Spike conical, surrounded at base by a persistent showy involucre of 5 to 8 bracts; each flower (except the lowest) also subtended by a small white bract. Ovary sunk in the rachis of the spike; stigmas 2 or 3. Capsule dehiscent at the apex. (Greek anemone, and opis, appearance, since the flowers resemble those of Anemone.)

1. *A. californica* Hook. YERBA MANSA. Stems hollow, $\frac{1}{2}$ to 2 ft. high, with a broadly-ovate or elliptic clasping leaf above the middle and a fascicle of 1 to 3 small petioled leaves in the axil; radical leaves elliptic-oblong, rounded above, often somewhat narrowed toward the cordate base, 2 to 8 in. long, on petioles 5 to 8 in. long or less; spikes $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; involucre bracts white (or reddish beneath), oblong, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; floral bracts obovate, clawed, $2\frac{1}{2}$ to 3 lines long; stamens 5 or 6; ovules 6 to 10 on each placenta.

Saline and rather wet lowlands: lower Sacramento Valley; San Joaquin Valley; South Coast Ranges; Southern California. An infusion of the root is used by Spanish-Californians both as a liniment for skin troubles and as a tea for disorders of the blood,

SALICACEAE. WILLOW FAMILY.

Deciduous trees or shrubs of rapid growth, light wood and bitter bark. Leaves simple, alternate, with stipules. Flowers dioecious, arranged in catkins, these falling off as a whole, the staminate after shedding the pollen, the pistillate after ripening of the fruit and dispersion of the seeds. Bracts (or scales) of the catkin scale-like. Calyx and corolla none. Stamens 1 to many. Ovary 1-celled; stigmas 2 to 4. Fruit a 2 to 4-valved capsule enclosing many seeds furnished with a tuft of hairs at base.

Scales entire or merely denticulate, persistent or sometimes deciduous; flowers without disk; stamens usually 1 to 5.....1. *SALIX*.
Scales fimbriate or lacerate, caducous; flowers with a broad disk; stamens usually numerous2. *POPULUS*.

1. *SALIX* L. WILLOW.

Trees or shrubs with mostly narrow short-petioled leaves. Winter buds covered by a single scale. Catkins mostly erect, appearing before or with the leaves. Staminate flowers with 1 to 9 stamens and 1 or 2 little glands. Pistillate flowers with a gland at the base of the ovary. Stigmas 2, short. Capsule usually 2-valved. (Classical Latin name of the Willow.)

Stamens 3 to 9, their filaments hairy or woolly below; style short; stigmas roundish, subentire; scales pale or yellowish, in the pistillate catkin more or less deciduous by maturity; capsules glabrous, pediceled; trees, the trunk bark rough.

Petioles with wart-like glands at summit; leaves lanceolate, long-pointed; stipules usually present, roundish; catkins in bud tapering, in flower usually straight, their scales erect1. *S. lasiandra*.

Petioles not glandular; stipules usually absent; catkins in bud cylindric.

Leaves broadly lanceolate, acute, shining green above, usually glaucous beneath; staminate catkins curving, their scales reflexed or spreading.....2. *S. laevigata*.

Leaves very narrow, nearly alike on both faces, finely serrulate, often curving towards apex3. *S. nigra*.

Stamens 2, their filaments woolly or hairy below; scales pale, somewhat deciduous; catkins on short leafy branchlets, often clustered; leaves linear or lanceolate; capsule sessile or nearly so; shrubs, the trunk bark smooth.

Stigmas linear, raised on a distinct style; capsule usually silky; leaves silvery or green, entire4. *S. sessilifolia*.

Stigmas oblong or roundish, sessile; capsule glabrous; leaves green, remotely serrulate. 5. *S. longifolia*.

Stamens 2 (rarely 1), their filaments glabrous; stigmas entire or notched, rarely parted into linear lobes; scales usually black or dark-colored, mostly persistent; trunk bark usually smooth.

Capsules glabrous; leaves dark green above, white-pubescent beneath; catkins sessile, leafless; filaments more or less united; small tree or shrub.....6. *S. lasiolepis*.

Capsules tomentose, silky or puberulent.

Style none; catkins short and dense, their scales black, with white hairs; leaves obovate, usually glabrate.....7. *S. fluviatilis*.

Style evident; catkins long and slender; stamens 1, or if 2 the filaments partly united; leaves conspicuously silky beneath.....8. *S. sitchensis*.

1. *S. lasiandra* Benth. YELLOW WILLOW. Tree 20 to 45 ft. high, the trunk with brown roughly fissured bark; one-winter-old branchlets yellowish; mature leaves lanceolate with long tapering or very slender point, 4 to 7 in. long, $\frac{3}{4}$ to $1\frac{1}{4}$ in. wide; petioles 3 to 9 lines long, glandular at the upper end; stipules on vigorous shoots conspicuous, orbicular, 5 to 12 lines broad; staminate catkins $1\frac{1}{4}$ to 3 in. long, usually straight; pistillate catkins $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long; scales erect; stamens 4 to 9; ovary glabrous.

Banks of living streams throughout the Coast Ranges, Sacramento and San Joaquin valleys, and Sierra Nevada southward to Southern California and northward to British Columbia.

2. *S. laevigata* Bebb. RED WILLOW. Tree 20 to 40 ft. high; one-winter-

old branchlets reddish; mature leaves oblong-lanceolate to lanceolate, obtusish at base, acute at apex or sometimes long-pointed, serrulate, glabrous, green and shining above, pale or conspicuously glaucous beneath, $2\frac{1}{2}$ to $7\frac{1}{2}$ in. long, $\frac{5}{8}$ to $1\frac{1}{4}$ in. wide; stipules minute and caducous or none; petioles $\frac{1}{2}$ to 4 lines long; staminate catkins commonly flexuous, $1\frac{1}{2}$ to $4\frac{1}{2}$ in. long; pistillate catkins $\frac{3}{4}$ to 2 in. long; scales soon spreading or reflexed; stamens 4 to 7 (sometimes 3); ovary glabrous.

Along living streams throughout the State.

3. **S. nigra** Marsh. BLACK WILLOW. Tree 20 to 40 ft. high; leaves lanceolate or linear-lanceolate, long-pointed, often falcate, serrulate, glabrous, green on both surfaces, 2 to 5 in. long, 2 to 3 lines wide; petioles 1 line long; stipules early deciduous; scales obovate, erect; staminate catkins $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; stamens 3 to 5; pistillate catkins $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, in fruit 1 to $2\frac{1}{2}$ in. long, becoming rather lax; ovary scantily pubescent or hoary.

River banks: Great Valley to Southern California, thence far eastward.

4. **S. sessilifolia** Nutt. SANDBAR WILLOW. Shrub with slender stems 5 to 14 ft. high, or becoming a tree up to 25 ft. high; foliage silvery or becoming more or less green; leaves linear, usually tapering to the acute apex and to the narrow but short petiole-like base, entire, 1 to 3 in. long, 2 to 4 lines wide; stipules none; staminate catkins $\frac{1}{3}$ to 1 in. long, slender (2 lines thick), in bud usually cylindric, the scales with acute green tips; pistillate catkins, $\frac{3}{4}$ to 1 in. long, 3 lines thick, often not dense; ovary sessile, densely silky; style present, stigmas linear.

Abundant in stream beds of the Coast Ranges, Great Valley and Sierra Nevada foothills, ranging northward into Oregon.

5. **S. longifolia** Muhl. LONGLEAF WILLOW. Shrub 5 to 15 ft. high with bright green foliage; leaves mostly glabrous, or sometimes minutely canescent, lanceolate or linear, tapering to apex and to a short petiole at base, remotely serrulate with cuspidate teeth, $\frac{3}{4}$ to 5 in. long, 2 to 4 lines wide; catkins terminal on leafy branches; staminate catkins $\frac{1}{2}$ to $1\frac{1}{8}$ in. long, 2 lines thick; pistillate catkins $\frac{1}{2}$ to 1 in. long; ovary pediceled or sometimes nearly sessile, glabrous; stigmas very short, sessile; scales densely woolly; fruiting catkin $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long.—(*S. fluviatilis*, var. 1st ed.)

Stream beds in valleys and foothills throughout the State and into the mountains to 4,000 ft; also far eastward.

6. **S. lasiolepis** Benth. ARROYO WILLOW. Shrub or tree 8 to 25 ft. high; trunk bark usually smooth; leaves oblong, suborbicular, obovate or linear, acute, obscurely serrulate, dull green and glabrous above, white-pubescent or pale beneath, $1\frac{1}{2}$ to 5 in. long, $\frac{1}{3}$ to $1\frac{1}{4}$ in. wide; catkins appearing before the leaves, sessile, densely silky-tomentose in the bud, suberect; scales dark; staminate catkins $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; stamens 2, filaments glabrous, more or less united below; pistillate catkins $\frac{3}{4}$ to 1 in. long, in fruit $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long; capsule glabrous or puberulent, short-pediceled.

Coast Ranges, Great Valley, Sierra Nevada foothills. Our most common willow along intermittent water courses in the dry hills; also occurring along living streams.

7. **S. flavescens** Nutt. NUTTALL WILLOW. Shrub 2 to 15 ft. high or a small tree 25 ft. high; branchlets with whitish or very dark bark; leaves broadly obovate or oblong-obovate, entire, rounded at apex or shortly acute, 1 to $1\frac{1}{2}$ (or 4) in. long, $\frac{1}{2}$ to $1\frac{1}{4}$ in. wide, yellow-green and lustrous above, yellow-

veined, glabrate or densely short-silky beneath; catkins appearing before the leaves, oblong or elliptic, $\frac{1}{2}$ to 1 in. long, 5 to 7 lines thick, sessile; scales black or black-tipped, covered with white hairs; stamens 2, conspicuously exerted, filaments glabrous; ovary short-pediceled, white-silky; style none, stigmas broadly linear.—(*S. nuttallii* var. *brachystachys* Sarg.)

Sierra Nevada, 4,000 to 10,000 ft., and seaward Coast Ranges, north to British Columbia and east to the Rocky Mts.

8. ***S. sitchensis*** Saxon. VELVET WILLOW. Shrub 5 to 12, or a tree up to 25 ft. high; leaves obovate to oblanceolate, rounded or shortly acute at apex, entire, dark green and almost glabrous above, densely tomentose and lustrous silky beneath, 2 to 5 in. long, 1 to 3 in. wide; stipules small, early deciduous or on sterile shoots broad or orbicular, 4 to 6 lines long; staminate catkins $1\frac{1}{4}$ to 2 in. long; stamens 1, or exceptionally 2 and their filaments more or less united; pistillate catkins $\frac{3}{4}$ to 2 in. long, in fruit 3 to 5 in. long; bracts covered with long white silky hairs; ovary silky, short-pediceled or sessile; style elongated, stigmas short-oblong, entire or nearly so.

California coastal region; Sierra Nevada, 5,000 to 7,000 ft.; far north to Alaska.

2. **POPULUS** L. POPLAR.

Trees with scaly buds and caducous stipules. Leaves rather long-petioled, broad. Winter buds covered by many scales. Catkins appearing before the leaves, in ours pendulous; scales fimbriate or lacerate, falling as soon as released by the flowering elongation of the catkin. Stamens inserted on the surface of a concave disk. Ovary seated on a collar-like disk; style short; stigmas 2 to 4, narrow and elongated, or conspicuously dilated. Capsule 2 to 4-valved. Coma of the small seeds long and conspicuous.—(Classical Latin name of the Poplar.)

Leaves deltoid-orbicular, 2 to 4 in. broad, broader than long, yellowish green, alike on both faces 1. *P. fremontii*.
Leaves ovate, $2\frac{1}{2}$ to 7 in. long, longer than broad, ovate, dark green above, rusty or silvery beneath 2. *P. trichocarpa*.

1. ***P. fremontii*** Wats. COMMON COTTONWOOD. Handsome tree commonly 40 to 90 ft. high with massive crown of spreading branches; leaves triangular or roundish in outline, 2 to 4 in. broad, broader than long, the margin crenate except at the abruptly short-pointed apex and the truncate or subcordate base; staminate catkins 2 to 4 in. long, densely flowered; stamens about 50 to 70; pistillate catkins loosely flowered; stigmas 3 or 4, roundish; capsules on pedicels 2 lines long; seeds copiously provided with long white hairs which soon involve the catkin in a soft cottony mass.

Living streams: Great Valley, Sierra Nevada foothills, South Coast Ranges to Southern California. Rare in North Coast Ranges or mostly absent (Jepson, *Trees Cal.*, p. 142).

2. ***P. trichocarpa*** T. & G. BLACK COTTONWOOD. Tree 40 to 125 ft. high with a broad head of upright branches; leaves broadly or narrowly ovate, finely serrate, truncate or heart-shaped at base, acute or tapering to a point at apex, $2\frac{1}{2}$ to $10\frac{1}{2}$ in. long, lustrous green above, rusty-brown beneath when young but at length whitish; staminate catkins 1 to 2 or eventually 5 in. long; stamens 40 to 60 on a slightly one-sided disk; pistillate catkins loosely flowered, $2\frac{1}{2}$ to 3 in. long, in fruit 4 to 10 in. long; stigmas 3, dilated and deeply lobed; capsules nearly sessile.

Along streams: Sierra Nevada, at middle altitudes; Coast Range valleys

but not common within our limits (Pajaro River, Alameda Creek, Mitchell Cañon at Mt. Diablo):

P. TREMULOIDES Michx. Aspen. Leaves round-ovate, 1 to 2 in. long; stamens 6 to 12.—High Sierra Nevada.

MYRICACEAE. SWEET-GALE FAMILY.

Shrubs or small trees. Leaves fragrant, alternate, simple, resinous-dotted, without stipules. Flowers in oblong or cylindrical catkins, unisexual, solitary and sessile in the axils of scaly bracts; perianth none. Staminate flower with 4 to 16 stamens, the bractlets usually 2; pistillate flower surrounded at base by 2 to 4 small scales or bractlets; ovary 1-celled, 1-ovuled; stigmas 2, filiform, sessile. Fruit a nutlet. Seed without endosperm.

1. MYRICA L. WAX MYRTLE.

The only genus. (Greek murike, the ancient name of the Tamarisk.)

1. *M. californica* Cham. WAX MYRTLE. Thickly branched evergreen shrub or small tree, 8 to 25 ft. high; leaves thickish, dark green, glossy, oblong, or oblanceolate-oblong, tapering above to an acute apex, narrowed below to a petiole, $2\frac{3}{4}$ to 5 in. long, remotely serrate or almost entire; flowers monoecious; catkins 2 to 5 lines long or more, the pistillate in the upper, the staminate in the lower, axils; androgynous catkins often occur between, with the staminate flowers at base; stamens 7 to 16, united by their filaments into a cluster longer than the bract; ovary ovate, stigmas bright-red; fruit globose, brownish purple, covered with a coat of whitish wax, 2 lines in diameter, the bractlets at the base minute.

Sand-dunes, moist hillsides, forest slopes, or rocky declivities near the ocean from Santa Monica northward along the entire Californian coast.

M. HARTWEGII Wats., Sweet Bay, a deciduous shrub of the Sierra Nevada with dioecious flowers; stamens 3 or 4, shorter than the bract; bractlets exceeding the glabrous nutlet.

JUGLANDACEAE. WALNUT FAMILY.

Deciduous trees with pinnately compound leaves without stipules. Flowers monoecious, appearing after the leaves. Staminate flowers numerous in pendulous lateral catkins. Pistillate flowers few on short erect terminal catkins. Ovary 1 to 3-celled, inferior. Fruit a nut with a dry husk; seed one, deeply 2-lobed.

1. JUGLANS L. WALNUT.

Bark strong-scented. Branchlets hollow, divided into little chambers by pithy partitions. Buds nearly naked. Staminate flower with an irregularly 3 to 6-lobed calyx and numerous stamens. Pistillate flower with a 4-lobed calyx. Seed so lobed as to fit the irregularities of the nut. (Latin Jovis, Jupiter, and glans, nut.)

1. *J. californica* Wats. CALIFORNIA BLACK WALNUT. Shrub or tree, low-branching, 10 to 30 ft. high; leaflets 11 to 19, oblong-lanceolate, serrate, $1\frac{1}{2}$ to 4 in. long; nut globose, $\frac{3}{4}$ to $1\frac{1}{4}$ in. in diameter.

Southern California from Santa Barbara Co. to San Bernardino and the Sierra Santa Aña. Var. *HINDSII* Jepson. Trees 50 to 75 ft. high with tall trunks; nuts 1 to $1\frac{3}{4}$ in. in diameter.—Walnut Creek; lower Sacramento River. Also in the Napa Range.

BETULACEAE. BIRCH FAMILY.

Wind-pollinated deciduous trees or shrubs with alternate simple petioled leaves and deciduous stipules. Flowers monoecious, mostly in catkins, flowering in late winter before the leaves appear. Staminate catkins elongated, pendulous, falling after flowering. Ovary 2-celled, one seed in each cell. Fruit a 1-celled 1-seeded nut or nutlet.

Fruit an acorn-like nut in a foliaceous tubular involucre.....1. *CORYLUS*.
Fruit a margined or winged nutlet, many in a woody cone.....2. *ALNUS*.

1. *CORYLUS* L. HAZELNUT.

Leaves thinnish, toothed. Stamens 4 (seemingly 8); filaments forked with the undivided portion obsolete in ours; calyx none. Pistillate flowers several in a scaly bud, 2 to each bract, each flower with 2 bractlets; calyx adnate to ovary and without limb; style short, stigmas 2, red, slender, elongated. Involucre formed of the enlarged and united bractlets. (Greek *koros*, a helmet, from the involucre.)

1. *C. rostrata* Ait. var. *californica* A.DC. Shrub, 6 to 10 ft. high; leaves roundish to obovate, $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long; involucre $\frac{3}{4}$ to 1 in. long; nut subglobose, 6 lines in diameter.

Hill country, Coast Ranges and Sierra Nevada. Feb.-Mar.

2. *ALNUS* Hill. ALDER.

Braets of staminate catkins covering 4 bractlets; flowers 3 in the axil of each bract; calyx 4 (or 6)-parted; stamens 1 to 7. Pistillate catkins erect, spike-like, ripening into woody cones, the bracts and bractlets united into 5-lobed scales persistent on the axis; flowers 2 in the axil of each bract; perianth none; styles 2. (The Latin name.)

Leaf-margin plane, with small scattered glandular teeth; bracts of staminate catkin obtuse; stamens 2, sometimes 3, 1, or 4.....1. *A. rhombifolia*.

Leaf-margin coarsely toothed, the entire margin with a narrow underturned edge; bracts of staminate catkin acute or acutish; stamens 4, rarely 3.....2. *A. rubra*.

1. *A. rhombifolia* Nutt. WHITE ALDER. Tree 30 to 80 ft. high; bark whitish or gray-brown; leaves oblong-ovate or -rhombic, tapering more or less to base and apex, 2 to 4 in. long; cones ovoid, 5 to 9 lines long.

Banks of rivers and living streams; Sierra Nevada cañons; Great Valley; Coast Ranges except in narrow coast strip occupied by Red Alder.

2. *A. rubra* Bong. RED ALDER. Tree 30 to 90 ft. high; bark very white or white mottled; leaves 2 to 6 in. long, elliptic-ovate, often rusty beneath, the coarse teeth again finely toothed; cones oblong-ovoid, $\frac{3}{4}$ to $1\frac{1}{8}$ in. long.—(*A. oregona* Nutt.)

Deep cool cañons or moist flats along the coast: Santa Inez Mts. to southern Alaska. Abundant from Marin to Humboldt cos., where it forms pure groves of singular beauty in marshy bottoms near the sea. Also called Oregon Alder.

A. TENUIFOLIA Nutt. Forming shrubby thickets.—Sierra Nevada, 6,000 to 7,000 ft.

FAGACEAE. OAK FAMILY.

Trees or shrubs with alternate simple leaves and promptly deciduous stipules. Flowers monoecious, apetalous, appearing with the leaves in the deciduous kinds. Staminate flowers in catkins; calyx parted into several lobes; stamens 4 to 12. Pistillate flowers 1 to 3 in an involucre of imbricated scales, the in-

volucres borne in reduced or short catkins, often solitary, or sometimes 1' or 2 at base of staminate catkin; ovary adherent to the calyx, 3-celled, 6-ovuled, only one ovule maturing, the remaining ovules and the other two cells abortive. Fruit a nut borne singly in a scaly cup or 1 to 3 in a spiny bur.

Fruit an acorn; catkins simple.

Catkins unisexual, the staminate drooping.....1. *QUERCUS*.

Catkins erect, all with staminate flowers, pistillate flowers at base of some of them.

2. *PASANIA*.

Fruit a spiny bur; catkins erect, often branching, unisexual, or with pistillate flowers at base of some of the staminate catkins.....3. *CASTANOPSIS*.

1. *QUERCUS* L. OAK.

Trees or shrubs of slow growth, hard wood and usually contorted branches. Flowers greenish or yellowish. Staminate catkins pendulous, one or several from the lowest axils of the season's shoot. Pistillate flowers borne in the upper axils of the season's shoot, the ovary with 3 to 5 styles or stigmas. Fruit an acorn, the nut set in a scaly cup. Abortive ovules often discernible in the ripe or nearly ripe acorn. (Latin name of the oak.)

A. Bark commonly white or whitish, wood light colored; stamens mostly 6 to 9; stigmas sessile or nearly so; abortive ovules mostly towards the base of nut.—White Oaks.

1. *Acorns ripe in first autumn; nut glabrous on the inner surface.*

Deciduous trees.

Branchlets pendulous; acorn cups deep, the nut long and slender; leaves pinnately parted with coarsely 2 to 3-toothed lobes; trunk bark dark brown, deeply checked into small cube-like or rectangular plates; valleys.....1. *Q. lobata*.

Branchlets not pendulous; acorn cups shallow; trunk bark white, shallowly checked but smoothish.

Leaves dark lustrous green above, rusty or pale beneath, 5 to 7-parted; nut sagglobose or oblong-cylindric; mainly North Coast Ranges.....2. *Q. garryana*.

Leaves bluish green above, pale beneath, oblong, coarsely toothed or entire; nut oval, often swollen at or below middle; dry foothills.....3. *Q. douglasii*.

Evergreen shrubs of the chaparral; leaves $\frac{3}{4}$ to 1 in. long.

Leaves plane or undulate, oblong, entire or unequally spinose-serrate, mainly deciduous in late winter; nut oval to cylindric, rounded or pointed at apex.....4. *Q. dumosa*.

Leaves revolute, equally spinose-dentate, persistent through winter; nut short-cylindric, rounded at apex.....5. *Q. durata*.

2. *Acorns ripe in second autumn; nut tomentose or hairy within.*

Evergreen trees; leaves commonly 1 to 2 in. long, entire or spinose-toothed, dull green above, lead color beneath or with a golden fuzz when young; acorn cup large, typically like a yellow turban; mountains6. *Q. chrysolepis*.

Bark dark or black, wood dark or reddish; stamens mostly 4 to 6; stigmas on long styles; abortive ovules mostly towards top of nut; nut tomentose within.—Black Oaks.

Evergreen trees; nut slender-ovate.

Acorns ripe in first autumn; leaves roundish or elliptic, convex above; coast valleys and hills7. *Q. agrifolia*.

Acorns ripe in second autumn; leaves oblong, obtuse or tapering to the acute apex, plane, pale yellowish below; interior valleys and hills.....8. *Q. wislizenii*.

Deciduous trees; acorns ripe in second autumn, oblong, obtuse; leaves pinnately parted, the divisions lobed and bristle-tipped; mountains.....9. *Q. kelloggii*.

1. *Q. lobata* Neé. VALLEY OAK. Graceful tree commonly 40 to 75 ft. high; leaves 3 to 4 (rarely 6) in. long, 2 to 3 in. wide, green above, paler beneath, yellow-veined, pinnately parted to the middle or nearly to the midrib into 3 to 5 pairs of lobes; lobes most commonly broadened towards the end, less frequently pointed, coarsely 2 or 3-toothed at apex, or sometimes entire; cup drab-brown, deeply hemispherical, very warty, $\frac{1}{2}$ to $\frac{3}{4}$ in. deep or more, of greater diameter than the nut; nut long-conical, at first bright green, later mahogany or chestnut-brown, $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. thick.

The most characteristic tree on the floors of the Sacramento, San Joaquin and Coast Range valleys, but not in valleys facing the sea. The round-topped crown is often broader than high, its spreading branches finally ending in long slender cord-like branchlets which sometimes sweep the ground (whence "Weeping Oak"). Called "White Oak" or "Water Oak" by settlers and Roble by the Spanish-Californians.

2. *Q. garryana* Dougl. OREGON OAK. Round-headed tree 25 to 55 ft. high, the trunk bark white, thin, superficially checked into small squarish scales; leaves 3 to 4 (or 6) in. long, $1\frac{1}{2}$ to $4\frac{1}{2}$ in. wide, dark lustrous green and nearly glabrous above, rusty or pale, finely pubescent and yellow-veined beneath, leathery in texture and pinnately parted into 5 to 7 (rarely 9) lobes with mostly deep and often acute sinuses; lobes entire or with 2 or 3 coarse rounded unequal teeth; cup very shallow, 6 to 9 lines broad, with tuberculate scales; nut bulging beyond the small cup, typically subglobose but varying to obovoid or subcylindric, although always rounded at apex, $\frac{3}{4}$ to 1 in. long, $\frac{2}{3}$ to $\frac{3}{4}$ in. thick, its surface polished and shining.

Chiefly in the higher mountains near the coast: Santa Cruz Mts.; Mt. Tamalpais; northward to Mendocino and Humboldt cos., and far northward to British Columbia. Also called "Post Oak."

3. *Q. douglasii* H. & A. BLUE OAK. Tree 20 to 60 ft. high, the white trunk bark shallowly checked into small thin scales, this characteristic roughness extending well out to the smaller branches; leaves minutely pubescent, bluish green above, pale beneath, 1 to 3 in. long, $\frac{1}{2}$ to 3 in. wide, mostly oblong to obovate, entire, or coarsely and often unequally few-toothed, or shallowly lobed; acorns ripe in first autumn; cup 4 to 6 lines broad, of less diameter than the nut and very shallow, the scales developing small wart-like processes; nut $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, 6 to 10 lines thick, dark or light brown, oval in outline but variable, often much swollen just below or at the middle or only on one side, or again narrow and tapering to apex.

Common on hot interior foothills, often the only tree where it grows, or associated with Digger Pine or Interior Live Oak: Sierra Nevada foothills and inner Coast Range, ranging west to the Napa Range, Walnut Creek and Monterey Co. Called Mountain Oak and Iron Oak by settlers.

4. *Q. dumosa* Nutt. SCRUB OAK. Shrub 2 to 8 ft. high, with tough rigid branches and branchlets; leaves typically oblong to elliptic or roundish, entire or more commonly irregularly spinose-serrate, or sinuate-lobed with sharply cut or angular sinuses, $\frac{3}{4}$ to 1 in. long; cup shallowly or deeply saucer-shaped to turbinate, 5 to 8 lines broad, 2 to 5 lines deep, often rusty, the scales tuberculate, sometimes so regularly as to suggest a quilted cushion; nut oval to cylindric, rounded or pointed at apex, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long.

Common chaparral shrub in the mountains of Southern California, ranging northward through both the Coast Ranges and Sierra Nevada, more or less abundant in the middle and southerly parts of those ranges, rarer in the north (Yaca Mts.; Napa Range; Ukiah). Highly variable in leaf texture and outline and in acorn character, both of cup and nut. (See chaparral in index.)

5. *Q. durata* Jepson. LEATHER OAK. Low spreading shrub with rigid branches, 2 to 5 ft. high; younger branches and leaves densely tomentose; leaves oval, dentate with prickly equal teeth, above convex, the margin more or less revolute; cup bowl-shaped, 8 to 9 lines broad, 4 to 5 lines high, the

scales tuberculate; nut short, thick, cylindric, rounded at apex, 7 to 9 lines long.

San Carlos Range and northward to the Napa Range.

6. *Q. chrysolepis* Liebm. MAUL OAK. Tree 20 to 60 ft. high with roundish or often spreading crown, or frequently reduced to a small shrub; trunk bark whitish, rather smooth; leaves 1 to 2 (sometimes even 4) in. long, thick, green above, yellow beneath with a fine fuzz or powder, or eventually lead-color or dull white, ovate or oblong-ovate, acute at apex, entire, or with entire and toothed leaves frequently found on the same twig; typical cup thick and round-edged with a fine fuzzy or felt-like tomentum concealing the scales, the whole suggesting a yellow turban, but thinnish cups and scanty pubescence not concealing the scales occur as frequently; nut ovate, globose, or cylindric, rounded at apex or sharply pointed, 1 to $1\frac{1}{4}$ in. long, $\frac{3}{4}$ to 1 in. thick.

Mountain ridges, slopes and cañons almost throughout California, extremely variable in habit and in the acorns. Not occurring in the foothills. Called Cañon Oak, Gold-cup Oak and Mountain Live Oak. It furnishes the most valuable wood amongst our species, being strong, tough and close-grained.

Q. VACCINIFOLIA Engelm. Huckleberry Oak. Low evergreen shrub; branches slender and pliable, forming broom-like tufts at top of stems; leaves very small, mostly entire, no golden fuzz; acorn-cup thin; nut globose-ovate, 4 to 6 lines long.—Sierra Nevada, 5,000 to 10,000 ft., often gregarious.

7. *Q. agrifolia* Neé. COAST LIVE OAK. Low broad-headed tree 20 to 70 ft. high; trunk bark smooth and beech-like or irregularly fissured; leaves roundish, elliptic, sometimes ovate or oblong, usually with spine-tipped teeth or sometimes entire, commonly 1 or 2 in. long but varying from $\frac{1}{2}$ to 4 in., usually convex above; cup broadly turbinate, 4 to 7 lines deep, usually embracing only the base of the nut; nut slender, pointed, 1 to $1\frac{1}{2}$ in. long, 5 to 7 lines thick.

Rich valley floors and rocky hills, abundant from Sonoma and Napa cos. to Alameda and Santa Clara cos. and southward to Southern California. Encina of the Spanish-Californians. Called simply "Live Oak" by the people.

8. *Q. wislizenii* A.DC. INTERIOR LIVE OAK. Round-crowned tree 30 to 75 ft. high; trunk bark dark, very smooth or sometimes roughly fissured; leaves typically oblong (varying to elliptic, ovate or ovate-lanceolate), either tapering to apex or rounded, 1 to $2\frac{1}{2}$ (or 4) in. long, entire or spiny-toothed, green and shining above, pale yellowish green below; cup deeply cup-shaped to hemispherical, embracing $\frac{1}{4}$ to $\frac{1}{2}$ the nut, 6 or 7 lines broad, the scales thin, red-brown; nut cylindric and tapering to the apex or conical, often streaked longitudinally with dark lines converging at the summit, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. long.

Dry mountain slopes and fertile valley floors: Sierra Nevada foothills, Great Valley and inner Coast Range. Called simply "Live Oak" by the people. Var. *FRUTESCENS* Engelm. is a scrub form in the chaparral on the higher Coast Range summits.

9. *Q. kelloggii* Newb. CALIFORNIA BLACK OAK. Graceful tree with broad rounded crown, 30 to 80 ft. high; trunk bark dark, checked into small plates; leaves deeply and mostly sinuately parted with about 3 lobes on each side ending in 1 to 3 or more coarse bristle-tipped teeth, lustrous green above, lighter beneath, often white with a fine tomentum when young, 4 to 10 in. long and $2\frac{1}{2}$ to 6 in. wide; cup large, $\frac{1}{2}$ to 1 in. deep, $\frac{3}{4}$ to $1\frac{1}{8}$ in. broad, its scales thin, with a membranous and sometimes ragged margin; nut deeply

set in the cup, typically oblong in outline, rounded at apex, 1 to $1\frac{1}{4}$ in. long and $\frac{3}{4}$ in. thick, covered at first with a fine fuzz.—(*Q. californica* Cooper.)

Mountain slopes and gravelly valleys, Sierra Nevada and Coast Ranges, but not near the sea.

2. PASANIA Miq. TAN OAK.

Evergreen trees or shrubs with evergreen leaves and erect catkins. Staminate flowers one in a place, densely disposed in elongated simple catkins; stamens 8 to 10, 4 times as long as the 5-parted calyx. Pistillate flowers 1 in an involucre, the involucres few at the base of some of the staminate catkins; calyx often with rudimentary stamens; ovary 3-celled. Fruit an acorn, the cup with slender spreading scales. (*Pasania*, native name of one of the species in Java.)

1. *P. densiflora* Oerst. TAN OAK. Large tree 50 to 150 ft. high; leaves oblong, acute, strongly parallel-nerved beneath, the nerves ending in the teeth of the margin, $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long, 1 to $1\frac{3}{4}$ in. wide; catkins slender, 2 to 4 in. long; acorns ripe in second autumn; cup $\frac{3}{4}$ to $1\frac{1}{4}$ in. broad; nut globose or short thick cylindric, 1 to $1\frac{1}{2}$ in. long, covered with a deciduous close woolly coat.—(*Quercus densiflora* H. & A.)

Fertile mountain slopes and ridges, associated with the Redwood, or in Mendocino and Humboldt cos., most highly developed in the "Bald Hills" country just inside the Redwood Belt. The bark is peeled in large quantities for tanning leather.

3. CASTANOPSIS SPACH. CHINQUAPIN.

Evergreen trees or shrubs. Catkins slender, erect. Staminate flowers in clusters of 3, disposed in elongated simple or sometimes branching catkins; calyx 5 or 6 parted; stamens 10 or 12; ovary rudiment present. Pistillate flowers 1 to 3 in an involucre, the involucres on shorter catkins or sometimes scattered at the base of the staminate catkins; calyx 6-cleft with abortive stamens on its lobes; ovary 3-celled with 2 ovules in each cell; styles 3. Fruit ripe in second autumn, the spiny bur-like involucre enclosing 1 to 3 nuts. Nuts ovoid or globose, more or less angled, usually 1-seeded. (Greek *kastanea*, chestnut, and *opsis*, resemblance.)

Tree with thick rough bark, less commonly a shrub; leaves $2\frac{1}{2}$ to $5\frac{1}{2}$ in. long; usually long-pointed 1. *C. chrysophylla*.
Shrub, low and spreading, with thin bark; leaves $1\frac{1}{2}$ to 3 in. long, usually obtuse..... 2. *C. sempervirens*.

1. *C. chrysophylla* A.DC. GIANT CHINQUAPIN. Tree 50 to 115 ft. high with the very thick trunk bark broken into longitudinal furrows; leaves oblong, tapering to base and also to the apex (commonly abruptly long-pointed), entire, dark green on the upper surface, at first golden with a fine tomentum below, later light olive-yellow, $2\frac{1}{2}$ to $5\frac{1}{2}$ in. long, $\frac{3}{4}$ to $1\frac{3}{4}$ in. wide, the nerves straightish, forking well inside the margin; burs chestnut-like, irregularly 4-valved, containing 1 or sometimes 2 subtriangular nuts 4 or 5 lines long with hard shell and sweet kernel.—(*Castanea chrysophylla* Dougl.)

Deep soil of mountain ridges and slopes from Mendocino Co. (where it is associated with the Redwood) north to the Oregon Cascade Mts. Often called Chestnut, Red Oak and Bur Oak. Var. *MINOR* Benth. Golden Chinquapin. Shrub 3 to 15 ft. high; leaves with the sides partly folded along the midrib (trough-like), very golden below.—Rocky ridges and slopes: Monterey; Santa Cruz Mts.; Moraga Ridge; Mt. Tamalpais and north to the Mendocino coast.

2. **C. sempervirens** Dudley. BUSH CHINQUAPIN. Spreading shrub 1 to 8 ft. high with smooth brown bark; leaves oblong, acutish at base, acute or obtuse at apex, or sometimes tapering upwards from near the base and therefore lanceolate-oblong, $1\frac{1}{2}$ to 3 in. long and 5 to 11 lines wide.

Arid mountain slopes or rocky ridges: Sierra Nevada (3,000 to 8,000 feet); Coast Ranges (1,500 to 4,000 feet).

PLATANACEAE. PLANE FAMILY.

Large deciduous trees with alternate ample palmately lobed leaves and sheathing stipules; dilated base of petiole enclosing the bud of the next season; bark falling away in thin plates. Flowers monoecious, the staminate and the pistillate on separate axes, closely packed in separate ball-like clusters distributed at intervals along a terminal very slender axis, the inflorescence thus appearing moniliform. Receptacles very hairy and individual flowers difficult to segregate. Calyx and corolla none. Stamens with long anthers and very short filaments densely crowded on a globose fleshy receptacle. Pistils with interspersed clavate truncate bracts, crowded on a similar receptacle; ovary 1-ovuled; style one, filiform, laterally stigmatic. Fruit a coriaceous nutlet with tawny hairs about the base.

1. PLATANUS L. PLANE TREE.

The only genus. (Greek *platus*, broad, referring to the ample leaves.)

1. **P. racemosa** Nutt. WESTERN SYCAMORE. Tree 40 to 90 ft. high with a massive crown of wide-spreading limbs; leaves $3\frac{1}{2}$ to 9 (or 13) in. long, commonly broader than long, parted into 3 to 5 broad, spreading fingers or lobes; margin entire or with few small teeth; stipules very conspicuous when full grown, roundish or angular in outline and encircling or sheathing the stem; ball-like flower clusters, 2 to 7 in number, distributed at intervals along a pendulous and very slender axis borne at or near the end of a branch; balls falling to pieces in the winter, releasing the seed-like nutlets.

Common and sometimes abundant in river-bottoms, Sacramento Valley southward through the San Joaquin and South Coast Ranges to Southern California. Individual trees frequently attain great size. The trunks are often remarkable for their great divergence from the perpendicular, due to the shifting character of the soil in stream beds.

URTICACEAE. NETTLE FAMILY.

Herbs with simple leaves. Flowers small (ours less than 1 line long), greenish, unisexual, clustered, the clusters disposed in catkin-like axillary spikes or loose axillary heads. Petals none. Staminate calyx with 4 distinct or nearly distinct sepals and as many opposite stamens, the filaments coiled or bent inward in the bud so that when released, they fly upwards like a spring, scattering the pollen. Pistillate calyx 2 to 4-toothed or -cleft, or of nearly distinct segments. Ovary superior, 1-celled, with 1 orthotropous erect ovule; style and stigma 1. Embryo straight. Endosperm oily. Fruit an achene, always enclosed or covered by the calyx.

Pistillate calyx 4-parted, the segments almost distinct, the inner ones largest....1. URTICA.
Pistillate calyx saccate, 2 to 4-toothed at orifice.....2. HESPEROCNIDE.

1. URTICA L. NETTLE.

Annual or perennial herbs with stinging hairs. Leaves opposite, petioled,

3 to 7-nerved, serrate, with stipules. Flowers in ours monoecious, clustered, the clusters in axillary often branching spikes. Staminate flowers with 4 sepals, 4 stamens and the cup-shaped rudiment of a pistil. Pistillate calyx with the sepals unequal, the exterior smaller than the inner and at length enclosing the flattened achene; ovary with sessile tufted or almost feathery stigma. Endosperm scanty. (Ancient Latin name.)

Pistillate and staminate flowers in separate spike-like inflorescences; the pistillate somewhat shorter than and in axils above the staminate; perennial.

Herbage gray; leaves ovate to lanceolate.....1. *U. gracilis*.
Herbage dark green; leaves broadly ovate, cordate at base.....2. *U. californica*.
Pistillate and staminate flowers mixed in the same cluster; herbage dark green; annual.
3. *U. urens*.

1. *U. gracilis* Ait. var. *holosericea* Jepson. CREEK NETTLE. Stem strict, unbranched, 4 to 10 ft. high; leaves long ovate to lanceolate, more or less pubescent on both faces or the upper surface green and with scattered bristles and the lower surface gray, 3 to 5 in. long; flowers sessile in small clusters, these disposed in simple or somewhat paniculately branched spikes; spikes often shorter than petioles.—(*U. holosericea* Nutt.)

Moist valleys, marshes, damp spots in the hills and along creeks; common and often abundant throughout California.

2. *U. californica* Greene. COAST NETTLE. Stem often branched from the base, 2 to 4 ft. high, producing stolons; stems and petioles hispid and somewhat pubescent; leaves broadly ovate, deeply cordate, coarsely serrate, subglabrous above, shortly pubescent below and often gray, 3 to 4 in. long and nearly as broad, or the lower 4 to 7 in. long; spikes simple or paniculately branched, mostly exceeding petioles.—(*U. lyallii* Wats. var. *californica* Jepson.)

Low lands near the coast from San Mateo Co. northward to Marin Co.

3. *U. urens* L. SMALL NETTLE. Erect and simple or branching from the base, 1 to 1½ ft. high, leafy to the top, very sparingly hispid; leaves elliptic or ovate, coarsely lacinate-serrate, 3 to 5-nerved, ½ to 1½ in. long, slender petioled; stipules short, about 1 line long; flowers more or less pediceled in glomerules, the glomerules in an oblong rather dense spike often shorter than the petioles; fruiting calyx with hispid-ciliate margins.

Native of Europe, now widely naturalized in central and Southern California.

2. HESPEROCNIDE Torr.

Annual herbs similar to *Urtica*. Stipules minute. Staminate calyx with 4 almost distinct sepals. Pistillate calyx consisting of a membranous flattened oblong-ovate sac with a minutely 2 to 4-toothed orifice. (Greek *hespera*, west or western, and *knide*, a nettle.)

1. *H. tenella* Torr. Slender, erect or straggling, 1 or 2 ft. high; stems and petioles bristly with scattered hairs, the blades very sparsely hispid; leaves thin, ovate, serrately incised, ½ to 1½ (or 2) in. long on slender petioles; flowers densely glomerate in the axils, the clusters shorter than the petioles; pistillate calyx thin, hispid with hooked hairs, in fruit ½ to less than 1 line long; achene with minutely roughened surface.

Coast Ranges from Napa Valley southward to Southern California.

PARIETARIA DEBILIS Forst. Annual; leaves alternate, entire, without stipules; hairs not stinging; achene ovoid; pistillate calyx tubular, 4-cleft.—Southern California.

POLYGONACEAE. BUCKWHEAT FAMILY.

Our herbs or low bushes with simple leaves. Flowers small, regular, mostly perfect, without petals, and rarely solitary. Stamens 4 to 9, slightly perigynous. Calyx 5 to 6-cleft or -parted. Ovary superior, 1-celled, 1-ovuled and bearing 2 or 3 styles or stigmas. Fruit an achene, triangular in all of ours except some species of *Polygonum* and *Eriogonum*.

A. Leaves without stipules, opposite, or in no. 5 mostly radical or alternate; flowers borne in an involucre (except no. 2).

Involucre bract-like, 1-flowered, enlarged in fruit, 2-lobed, 2-saccate on the back; leaves opposite, broad 1. *PTEROSTEGIA*.

Involucre none; calyx involucre-like; leaves linear, in whorls 2. *LASTARRIAEA*.

Involucre tubular, campanulate or turbinate; leaves alternate or in whorls or radical. Involucre one-flowered; teeth of the involucre 3 to 6, cuspidate or awned, often hooked. 3. *CHORIZANTHE*.

Involucre two to many flowered and

Deeply 4 (3 to 5) -cleft, the lobes bearing bristles or awns, or awnless 4. *OXYTHECA*.

Four to 8-toothed, the teeth blunt or at least not bristly 5. *ERIOGONUM*.

B. Leaves with sheathing stipules, alternate; flowers without involucre.

Sepals 6, the outer 3 reflexed in fruit, the inner 3 erect and enlarging; calyx closing about the fruit and persisting as a hardened covering to the achene; flowers mostly green 6. *RUMEX*.

Sepals 5 (or 4), equal and erect in fruit; flowers mostly colored 7. *POLYGONUM*.

1. PTEROSTEGIA F. & M.

Very slender and weak annuals with dichotomous branches and opposite leaves. Flowers solitary and sessile, longer than the subtending involucre. Involucres terminal and nearly sessile in the forks, consisting of a single bract, rounded and more or less 2-lobed, dentate on the margin, in fruit enlarged, scarious and reticulated, loosely enclosing the achene and with 2 sac-like protuberances on the back. Calyx 6 or 5-parted; stamens as many or fewer than the lobes. (Greek *pteron*, a wing, and *stegia*, a covering, in reference to the involucre.)

1. *P. drymarioides* F. & M. Stems commonly several from the base, usually with a branch at each node, diffuse or straggling, a few in. to 1 ft. long; leaves roundish or broader than long and notched once or twice at apex or even cleft, or distinctly fan-shaped or obcordate, 3 to 6 lines broad, narrowed at base to a slender but mostly short petiole; flower reddish, less than 1 line long; perianth-segments oblong-lanceolate.

Open woods under oaks or in the shade of rock outcroppings: Coast Ranges and Sierra Nevada to Southern California. April-May.

2. LASTARRIAEA Remy.

Small, fragile annual, diffusely branched from the base. Leaves linear, in cauline whorls and in a radical tuft which disappears early. Floral bracts in whorls, with hooked awns. Involucre none. Flowers sessile in the forks and terminal. Calyx simulating an involucre, tubular, 5 to 6-cleft to the middle, the teeth with recurved, hooked awns. Stamens 3, inserted on the throat, with a small membranous tooth on each side of the filaments. (Jose Victorino Lastarria, 1817-1888, Chilean publicist and writer on the constitutional history of Chile.)

1. *L. chilensis* Remy. Branches 2 to 8 in. long; floral bracts concealing the flowers; perianth 1 to 1½ lines long.

Introduced from Chile. Antioch; southward to Kern and Monterey cos. and Southern California. May-June.

3. CHORIZANTHE R. Br.

Low, dichotomously branched annual herbs of summer, with rosulate radical leaves (which disappear early in the dry season). Cauline leaves opposite or ternate, frequently reduced and bracteate, the bracts sometimes unilateral. Involucres (in ours) 1-flowered, tubular or funnelform, always sessile, 3 to 6-angled or -costate, and 3 to 6-toothed or -cleft; teeth divaricate, cuspidate or awned, the awns very frequently with a hooked tip. Flowers pedicellate or nearly sessile, ebracteolate, included within the involucre or the segments protruding. Calyx 6-parted or -cleft, often colored, never herbaceous. Stamens usually 9 (seldom 3 or 6), adnate to the base of the tube. Ovary glabrous. Embryo with inflexed or straight radicle. (Greek chorizo, to divide, and anthos, flower, on account of the parted perianth.)

Involucral teeth equal or the three alternate shorter.

Erect plants.

Calyx-segments equal, nearly distinct; involucre with broad scarious margin..... 1. *C. membranacea*.

Calyx-segments very unequal, the alternate shorter; involucral margin none..... 2. *C. valida*.

Calyx shortly cleft, segments equal; involucral margin none or scanty.... 3. *C. robusta*.
Erect or diffuse plants; involucral margins pink or white; calyx shortly cleft; segments equal 4. *C. douglasii*.

Prostrate plants.

Calyx-segments unequal 5. *C. polygonioides*.

Calyx-segments equal.

Involucre usually margined; stamens 9..... 6. *C. pungens*.

Involucre not margined; stamens 3..... 7. *C. clevelandii*.

Involucral teeth very unequal, 1 long and 5 very short; prostrate..... 8. *C. uniaristata*.

1. *C. membranacea* Benth. Erect, 6 to 14 in. high, unbranched, or once or twice dichotomous at the summit of the stem; herbage lanate throughout, floccose in age, the upper surface of the leaves glabrate; internodes about 2 in. long; leaves $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, linear, sessile, or gradually narrowed into a short petiole; involucres condensed into dense head-like cymes, these solitary in the upper axils and terminating the branches; margin of the involucre wholly scarious between the awned teeth; awns slender, uncinatate, and strongly divergent; flowers 2 or 3, of these 1 or 2 undeveloped or nearly obsolete; calyx-segments distinct, broadly obspatulate with long, narrow claw.

Inner Coast Range from the Vaca Mts. to Mt. Diablo.

2. *C. valida* Wats. Erect, 4 to 6 in. high, once or twice di- or tri-chotomously branched; leaves spatulate; involucral teeth or lobes not margined but awned; awns mostly straight; inflorescence similar to the preceding; flowers pedicellate, partly exserted; calyx-segments oblong, erose-denticulate, hirsute along the back on the midvein, very unequal (the alternate only $\frac{1}{2}$ as long.)

Sonoma; Petaluma; Russian River. Rarely collected.

3. *C. robusta* Parry. Stout, erect, 6 to 24 in. high, ternately and dichotomously branched above, the stem below bearing two or three whorls of spatulate leaves, 2 in. long or less; heads large, dense, mostly terminal or subterminal; involucre with narrow margins or none, teeth mostly uncinatate, the alternate shorter; calyx cleft $\frac{1}{3}$ the way down, slightly exserted or not at all; segments equal, oblong, apiculate.

Sandy soil at Alameda and near Santa Cruz.

4. *C. douglasii* Benth. Erect, with slender diffuse branches from the base or more commonly simple below, 3 to 10 in. high, pubescent throughout; radical leaves oblanceolate; cauline similar but reduced above, 3 to 6 lines long; involucres in small loose clusters, each $1\frac{1}{2}$ lines long, densely hairy in the

furrows, with pink scarious margins and straight or uncinate awns; calyx-segments apiculate, the alternate often emarginate; hairy on the back.

Santa Cruz Mts. Var. *DIFFUSA* Parry; has all the cauline leaves reduced to narrow or very small bracts and the margins of the involucre usually white.

5. *C. polygonioides* T. & G. Dichotomously branched, forming mats 5 to 10 in. across; bracts in pairs, oblanceolate or obovate, resembling the leaves of the radical rosette and becoming smaller towards the ends of the branches; involucre ob-pyramidal, without scarious margin, solitary or in 2s or 3s, the tube 1 to $1\frac{1}{2}$ lines long, the 3 larger segments as long and with alternating short ones at base.

Napa Range, eastern Alameda Co., Sierra Nevada, and southward to Southern California.

6. *C. pungens* Benth. Somewhat slender, villous-pubescent, the branches prostrate or at first erect, 2 to 15 in. long, sub-dichotomous; leaves spatulate or oblanceolate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, opposite petioles of the cauline leaves 3 lines long, those of the radical 9 lines or less; bracts linear or subulate, acerose; involucre clustered on short lateral branchlets 2 to 3 lines long, unequally toothed, the alternate shorter; teeth of the involucre scarious margined, strongly uncinate; calyx narrowed at base, cleft about $\frac{1}{2}$ the way down; segments equal, oblong, erose-denticulate at summit, mucronulate; stamens 9, unequal, filaments plainly adnate to the lower part of the tube; styles slender, equaling the stamens.

Sand hills, San Francisco Peninsula southward to Monterey.

7. *C. clevelandii* Parry. Plants prostrate, branched from the base, 4 to 16 in. broad, hairy pubescent; radical leaves ovate-spatulate, cauline leaves narrow and pungent; involucre with unequal divergent uncinate teeth; outer calyx-segments shortly cleft, broadly ovate, erose, the inner narrow and laciniate; stamens 3.

Eastern Napa Co.; Lake Co.

8. *C. uniariolata* T. & G. Stems prostrate, 2 to 6 in. long, with a short, soft pubescence; leaves broadly spatulate, the bracts oblanceolate, cuspidate; involucre numerous but rather loosely cymose on the branches or sometimes densely clustered; involucre teeth not margined but awned; one awn long and straight, the others very short and hooked; flowers cream-colored; outer segments of the calyx entire, obovate, the inner $\frac{1}{2}$ as long, oblong, crenate; stamens 6.

Mt. Diablo and through the South Coast Ranges, especially toward the interior.

4. *OXYTHECA* Nutt.

Slender annuals with the internodes more or less covered with stipitate glands and a repeatedly dichotomous inflorescence. Leaves in a rosette at base. Bracts foliaceous and more or less connate, often in 3s. Involucres few-flowered, more or less distinctly pedicellate, campanulate or turbinate, 3 to 5-cleft, the teeth bearing a bristle or awn, or awnless. Flowers mostly exerted. Calyx-segments equal, glandular-pubescent on the outside. Stamens 9. Achene commonly lenticular. (Greek oxus, sharp, and theke, case, in allusion to the spiny involucre.)

1. *O. hirtiflora* (Gray) Greene. About 6 in. high, glandular-puberulent; leaves oblong-spatulate, with scabrous ciliate margins and a broad red mid-vein; bracts hispid; involucre awnless, turbinate, $\frac{1}{2}$ line long, deeply and unequally 4-lobed, on erect or nodding pedicels 1 to 3 lines long; flowers

3 to 5, yellowish, tinged with red, $\frac{1}{2}$ line long; achenes triangular, exserted.—(*Eriogonum hirtiflorum* Gray.)

Scott Valley, Lake Co.; Mt. Diablo and Mt. Hamilton; Sierra Nevada.

O. *INERMIS* Wats. Bracts 2 or 3 lines long; involucre shortly pediceled, 4-cleft nearly to the base, awnless; flowers rose-color, $\frac{1}{2}$ line long; inner segments smaller and retuse.—Type locality rose-shrub Mt. Diablo.

5. *ERIOGONUM* Michx.

Annual or perennials with radical or alternate or whorled leaves without stipules, those of the inflorescence commonly reduced to bracts. Flowers perfect, involucre. Involucre 4 to 8-toothed or lobed, several to many-flowered; pedicels more or less exserted, intermixed with narrow scarious bractlets. Calyx 6-parted or -cleft, colored, persistent about the achene. Stamens 9, inserted on the base of the calyx. Styles 3; stigmas capitate. Achene triangular, except in a few species. Embryo straight, in the axis of scanty endosperm; cotyledons foliaceous. (Greek erion, wool, and gonu, knee or joint, the nodes hairy in some species.)

A. *Involucral lobes becoming reflexed; calyx narrowed to a stipe-like base.*

Involucres turbinate, deeply lobed, disposed in a simple or compound umbel raised on a scape-like peduncle from a leafy perennial and more or less woody base; filaments hairy below.

Woody base much branched; leaves obovate to oblanceolate, acute, $\frac{1}{2}$ to 1 in. long....

1. *E. stellatum*.

Woody base very short and simple; leaves oblong-ovate, cordate at base, $\frac{1}{2}$ to 2 in. long 2. *E. compositum*.

B. *Involucral teeth erect; calyx not attenuate at base.*

Involucres cylindric-turbinate or prismatic, with erect teeth, always sessile, either disposed in heads in a cymose panicle or umbel-like inflorescence, or solitary and scattered along the virgate branches; filaments usually glabrous.

Shrubby; leaves with revolute margins..... 3. *E. parvifolium*.
Herbaceous or mostly so.

Peduncles scape-like; involucre capitate-clustered; perennials.

Heads 1 to 3 or 4, large and terminal, or the peduncle forked and umbel-like; bractlets densely villous-tomentose 4. *E. latifolium*.

Heads scattered in an ample cymose panicle; bractlets glabrous..... 5. *E. nudum*.

Stems parted from the base or above the base into mostly elongated flowering branches, along which the solitary involucre are scattered, rarely 2 to several in a cluster.

Perennials with short woody stems which are densely leafy.

Leaves obovate or oblanceolate, acute; bracts all small and triangular.....

6. *E. trachygonum*.

Leaves roundish; lower bracts subfoliaceous..... 7. *E. saxatile*.

Annuals; leaves mostly in a rosette at base.

Inflorescence somewhat umbel-like, the 2 to 4 rays once or twice di- or tri-chotomous, or 1 or 2 simple..... 8. *E. truncatum*.

Plants for the most part di- or tri-chotomously parted from the base or the middle, with the flowering branches much elongated and the involucre scattered along them.

Involucres narrow or turbinate, 1 to $1\frac{1}{2}$ lines long; flowers glabrous; often diffusely branched.

White-woolly throughout; teeth of the involucre prominent.... 10. *E. gracile*.

Stems and inflorescence glabrous; teeth of the involucre inconspicuous....

9. *E. vimineum*.

Involucres cylindric, 2 lines long.

Flowers glabrous; erect and strictly branched..... 11. *E. virgatum*.

Flowers villous on the outside; more or less umbellately branched, sometimes

very diffuse 12. *E. dasyanthemum*.

Involucres turbinate, on filiform pedicels; panicle repeatedly dichotomous, commonly leafy at the nodes..... 13. *E. angulosum*.

1. *E. stellatum* Benth. Somewhat tomentose, the leaves densely tomentose on both sides or glabrate above; peduncles naked from a diffusely branched

woody base, the branches leafy, especially at the ends; leaves obovate to oblanceolate, acute, $\frac{1}{2}$ to 1 in. long; peduncle naked, 6 to 10 in. high, bearing an umbel of 2 to 4 usually elongated and cymosely-divided rays; nodes and lateral rays all leafy-bracted; lobes of the involucre nearly as long as the turbinate tube; flowers yellow or yellowish, slightly tinged with red on the outside, 2 or 3 lines long.

Higher altitudes: Sierra Nevada; summits of high Coast Ranges; Southern California.

2. **E. compositum** Dougl. Peduncles stout, 6 to 16 in. high from a simple short caudex; leaves oblong-ovate, cordate at base, $1\frac{1}{2}$ to 2 in. long, white-tomentose on the under side, the upper surface green and merely woolly-flocculent; petioles long ($1\frac{1}{4}$ to 4 in.); umbel either simple or compound, the 6 to 9 rays (often with a blackish band at middle) $\frac{1}{2}$ to 2 in. long, each bearing a short several-rayed umbellet, subtended by whorls of linear-oblancoate leaves; lobes of involucre short; flowers 2 to 4 lines long, cream-color or yellow.

North Coast Ranges: Mendocino Co. (rare) northward and far northward.

3. **E. parvifolium** Smith. Shrub 1 to 3 ft. high, or woody only at base; branches densely leafy with fascicled leaves; leaves ovate to oblong-lanceolate, undulate, revolute margined, truncatish at base, dark green and glabrate above, densely white-woolly below, 2 to 6 lines long, shortly petioled; peduncles mostly short, simple or forked, bearing a few close heads; involucre 6 to 8-lobed, many-flowered; flowers white, glabrous; filaments hairy at base.

Sand-dunes of the coast; Monterey to Southern California. San Francisco, (?) introduced.

E. **FASCICULATUM** Benth. Flat-top. Bushy shrub with shreddy bark, 2 to 4 ft. high, with leafy branches ending in a long naked peduncle bearing a several-rayed compound umbel or the umbel reduced and capitate; bracts linear; leaves linear or oblanceolate, revolute margined, $\frac{1}{2}$ in. long, white-woolly below, usually tomentose above; involucre many-flowered; flowers white, villous.—Abundant on mesas and mountain slopes in Southern California. Called "Wild Buckwheat." It is the third most valued native bee-plant after White Sage and Black Sage.

4. **E. latifolium** Smith. Stout, tomentose throughout, the indurated caudex with short leafy branches; leaves 1 to 2 in. long, oblong to ovate, obtuse or acute at apex, rounded or cordate at base, rarely cuneate, the margin often undulate and upper surface glabrate with under surface very densely woolly; petiole often margined; peduncles erect or ascending, 5 to 12 in. high, very stout, not fistulose; bracts triangular; involucre tomentose, 2 lines long, very many-flowered, crowded into large heads which are either solitary and terminal or few in a simple or nearly simple umbel; flowers glabrous, light rose-color, $1\frac{1}{2}$ lines long; bractlets densely villous-tomentose.

Rocky cliffs or sandy places along the sea-coast from Humboldt Co. to Southern California.

5. **E. nudum** Dougl. **TIBINAGUA**. Tall and slender, sparingly leafy at base; herbage mostly glabrous above; leaves broadly ovate or oblong, obtuse, $\frac{1}{2}$ to 2 in. long, cordate or abruptly cuneate at base, on slender petioles, undulate, densely tomentose beneath, becoming glabrate above; peduncle-like stem (fistulose and sometimes inflated) and the usually large panicle naked, $1\frac{1}{2}$ to 3 ft. high; involucre 2 or 3 lines long, glabrous or nearly so, usually 3 to 6 in each cluster; flowers glabrous (sometimes villous), 1 to $1\frac{1}{2}$ lines long, white or reddish, sometimes sulphur-yellow.

Dry foothills and middle elevations, common in both the Coast Ranges and Sierra Nevada. Called "Blood-root" in Contra Costa Co. and gathered for medicinal purposes. Var. *OBLONGIFOLIUM* Wats. Leaves broadly oblong, 1 to 2½ in. long, abruptly contracted to slender petioles 3 in. long; perianth usually somewhat pubescent on the inner lobes.—Napa Co. and northward.

6. *E. trachygonum* Torr. Stems several to many, erect, 6 to 11 in. high, very leafy, from a much branched woody base; leaves obovate or oblanceolate, acute, white-tomentose on both faces, short-petioled, 3 to 6 lines long, often with smaller ones fasciated in the axils, or the lowermost twice as long with longer petioles; inflorescence short-peduncled, once or twice dichotomous, the branches erect; lower involucre scattered, the upper approximate, campanulate-tubular, prominently but obtusely angled and woolly between the angles; flowers 2½ lines broad; sepals white with a green midrib, the inner longer than the outer.—(*E. wrightii* Torr. var. *trachygonum* Jepson.)

Dry gravel beds of the larger interior streams; inner Coast Ranges.

7. *E. saxatile* Wats. Tomentose throughout, becoming flocculent, 8 to 16 in. high, the base of the peduncles or caudex densely leafy; leaves roundish, both sides with a dense, often felt-like tomentum, 3 to 8 lines broad, short-petioled; peduncle 3 to 5 in. high, the branches of the inflorescence short and spreading; bracts (especially the lower) subfoliaceous, triangular or oblong, acute; involucre 1½ to 2 lines long, its teeth acute; flowers yellowish or rose-tinted, 2 lines long; sepals all spatulate-oblong and carinate, about equal.

Southern California, north in the Sierra Nevada to North Fork Kaweah River and in the Coast Ranges to the Santa Lucia Mts.

8. *E. truncatum* T. & G. Slender thinly tomentose annual 1 ft. high, with many stems from the base; leaves obovate or oblong-oblanceolate, with undulate margin, 1 in. long, attenuate to a slender petiole usually quite as long; peduncle short, bearing a leafy-bracted umbel-like inflorescence of 4 to 6 elongated rays, which are loosely once or twice di- or tri-chotomous; bracts almost minute; involucre solitary or 2 to 4 in a cluster, tomentose, oblong-turbinate, 2 lines long; flowers light rose-color, 1 line long.

Mt. Diablo region from Marsh's Ranch north to Antioch.

9. *E. vimineum* Dougl. Glabrous or at least not tomentose, unless at the very base, erect, 9 to 18 in. high, much branched from near the base, the branches elongated and virgate, with the lower commonly in whorls of 4 or 5; lower forks often leafy; leaves obicular to broadly ovate, 3 to 10 lines broad, greenish, reddish, or yellowish, white tomentose below; margin undulate, at least in age; the petioles as long or longer; involucre very narrow, 1 line long; flowers rather few, rose-color, or yellowish, 1 line long; outer sepals obovate, inner oblong.

Coast Range hills, especially slopes near rocky outcroppings. Var. *CANINUM* Greene. Stems numerous from the base, repeatedly di- or at first tri-chotomous, procumbent or very diffuse, sometimes erect and branching only above the base; inflorescence and stems reddish; involucre mostly at the ends of the short branches or sessile in the forks.—Oakland Hills; Marin Co.

10. *E. gracile* Benth. Floccose-tomentose throughout, somewhat strict and narrowly panicle, or more diffuse, 5 to 11 in. high; leaves oblanceolate or broadly oblong, attenuate to a slender petiole, 1 to 1½ in. long or less, tomentose on both sides or less so above; bracts more or less elongated or somewhat foliaceous; involucre 1 line long or less, broader above, with rigid

acute, and rather prominent teeth, often dark brown; flowers white, rose-color or yellowish, $\frac{3}{4}$ line long.

Dry interior plains, valleys and low hills.

11. *E. virgatum* Benth. Tomentose throughout, stem slender, erect, simple, or the few branches strict, 1 to 2 ft. high; leaves rosulate at the base, oblanceolate, an inch or two long, on slender petioles, the margin usually undulate; involucre rather remote, tomentose, cylindric, 2 lines long; bracts lanceolate, shorter than the involucre; flowers 1 line long, buff or sulphur-yellow.

Stream beds at low altitudes: Coast Ranges and Sierra Nevada.

12. *E. dasyanthemum* T. & G. Plants clothed with a thin coat of tomentum which is soon deciduous, 1 to 2 ft. high, more or less umbellately branching from or near the base, and often very bushy in habit; leaves roundish, plane, tomentose below, less so above, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, abruptly contracted to a slender petiole as long or half as long; involucre rather remote, cylindric, 2 lines long, tomentose between the callous ribs; flowers few, scarcely exserted, white or rose-color, densely villous on the outside.

Vaca Mts. to Clear Lake. Var. JEPSONII Greene in herb. Lower branches in whorls of 3 to 5; lower leaves 2 in. long; panicle ample; flowers deep red.—Vaca Mts.

13. *E. angulosum* Benth. Gray tomentose or nearly green, 3 to 14 in. high, diffusely branching from near the base, and repeatedly dichotomous, the plants frequently broader than high; branches 4 to 6-angled; radical leaves roundish to broadly oblong or lanceolate, commonly undulate, $\frac{1}{2}$ to 1 in. long, on rather short petioles; upper leaves oblong to lanceolate or oblanceolate, sessile or nearly so; involucre on filiform pedicels 3 to 8 lines long, mostly in the forks or terminal, hemispherical, 1 to 2 lines broad, many-flowered, glabrous or minutely glandular, bractlets mostly firm and dilated; calyx-segments pink with a red-purple midvein running nearly to the apex, $\frac{1}{2}$ line long, nearly glabrous; outer segments ovate, concave, the inner oblong-lanceolate.

South Coast Ranges and San Joaquin Valley to Southern California, common.

OXYRIA DIGYNA Campt. Mountain Sorrel. Alpine perennial herb; leaves round-reniform, long-petioled, mostly radical; sepals 4; achene surrounded by a broad wing and thus orbicular in outline.—Sierra Nevada, 7,000 to 10,000 ft.

6. RUMEX L.

Weed-like herbs, ours perennial (except no. 9). Leaves mostly in a basal rosette, those on the stem alternate, the petioles with somewhat sheathing stipules. Flowers mostly greenish, sometimes reddish or yellowish, pediceled and borne in usually crowded whorls along the branches of the panicle. Calyx of 6 nearly distinct sepals, the 3 outer spreading or reflexed, the 3 inner larger, continuing to grow after flowering and hugging the achene, 1 or more of them in many of our species bearing a wart or callous grain on the back. Fruits, therefore, more conspicuous than the flowers. Stamens 6. Styles 3, short; stigmas tufted (wind-pollinated) and maturing before the stamens. Achene triangular. (Old Latin name used by Pliny.)

Leaves hastate; flowers dioecious; sepals without callous grain, not reticulated and not longer than the achene; pedicels not jointed; roots red, scentless.—SORRELS.....

1. *R. acetosella*.

Leaves never hastate; flowers perfect or some staminate on the same plant; inner sepals commonly reticulated, in fruit becoming much longer than the achene; pedicels jointed; roots yellow, scented, bitter.—DOCKS.

Inner fruiting sepals entire (or nearly so) and

Without callous grains, 4 to 6 lines long; joint of the pedicels not prominent.....

2. *R. occidentalis*.

With callous grains (or 1 or 2 of the sepals naked), 1 to 2½ lines long; pedicels prominently jointed near the base.

Leaves strongly undulate, elliptical to oblong-lanceolate; fruiting sepals with a broad wing bordering the callous grain.....3. *R. crispus*.

Leaves slightly undulate, mostly oblong or ovate; callous grain nearly covering fruiting sepal, leaving only a narrow wing.....4. *R. conglomeratus*.

Leaves plane, mostly lanceolate; fruiting sepal triangular, usually much larger than the callous grain.....5. *R. salicifolius*.

Inner fruiting sepals with very prominent slender teeth or bristles; callous grains 1 to 3.

Perennial; flowering branches elongated and

spreading at wide angles; pedicels jointed near the middle.....6. *R. pulcher*.

Suberect; pedicels jointed near the base.....7. *R. obtusifolius*.

Annual; flowering branches usually short, the whorls mostly spicate-crowded; pedicels jointed near the base.....8. *R. persicarioides*.

1. ***R. acetosella* L. SHEEP SORREL.** Stems tufted, commonly 9 in. high; lower leaves hastate, the upper reduced or the branches leafless and ending in the reddish (pistillate) or yellowish (staminate) panicle; pedicels as long or twice as long as the flowers; staminate flowers 1 line long or less, the pistillate rather smaller.

Naturalized weed; common. The green leaves are very acid.

***R. HYMENOSEPALOUS* Torr.** Canaigre. Stem 2 ft. high, nearly simple, arising from a cluster of 2 to 12 tuberous or dahlia-like roots and ending above in a dense panicle ½ to 1 ft. long; leaves oblong or tapering to each end, slightly succulent, somewhat wavy-margined, ½ to 1 ft. long; sheathing stipules conspicuous; pedicels jointed near the middle, ½ to nearly as long as the fruit; inner sepals membranous and rosy in fruit, ovate, cordate at base, 4 to 6 lines long.—Dry sandy washes and sandy plains from Kern Co. and Nipoma southward; most abundant on the San Fernando and San Bernardino plains, thence eastward to Arizona and New Mexico. Roots used in tanning leather. The plants do not, however, do well in cultivation, irrigation decreasing the amount of tannin. The leaf-stem is used as a substitute for rhubarb, whence the names Wild Rhubarb, Wild Pie-plant and Sour Dock.

2. ***R. occidentalis* Wats. WESTERN DOCK.** Erect, glabrous, stout, and nearly simple, 3 or 4 ft. high; leaves somewhat fleshy, oblong-ovate or ovate-lanceolate, truncate or subcordate at base, mostly narrowed toward the apex, the blade 16 in. long or less, the petioles of the radical leaves longer than the blade; panicle strict, mostly very dense, 1 ft. long or more, leafless or with a few small leaves below, rosy in fruit; pedicels 3 to 6 lines long, obscurely jointed below the middle, as long or longer than the fruit; inner fruiting sepals broadly ovate, subcordate.

Marshes bordering San Francisco Bay.

3. ***R. crispus* L. CURLY DOCK.** Stem stoutish, commonly 2 ft. high; leaves bluish-green, very wavy-margined, elliptical to oblong-lanceolate, 10 in. long or less, the petioles 1 or 2 in. long; flowering branches strict with few leaves, the whorls dense, mostly crowded and red-brown in fruit; pedicels twice as long as the fruit, tumidly jointed near the base; inner fruiting sepals broadly ovate, 2 to 2½ lines long, all with smooth, callous grains, rarely 1 or 2 naked.

Very common naturalized weed in low or neglected lands. Stem from a tap-root as also in nos. 2 and 3 to 8. The half-fleshy root has astringent and tonic properties. Blade more or less decurrent on the petiole in this and the next.

4. ***R. conglomeratus* Murr. GREEN DOCK.** Stems slender, mostly clustered, 3 to 4 ft. high; leaves ovate or mostly oblong, slightly undulate, 4 in. long,

reduced above; flowering branches slender, erect very long ($\frac{1}{3}$ to $1\frac{1}{2}$ ft.), naked or with a lanceolate or ovate leaf subtending some or all of the remote whorls; pedicels as long as, or rather shorter than the fruit, tumidly jointed near the base and geniculate; fruit about 1 line long, the inner sepals oblong with callous grains mostly 3 and smooth.

Naturalized: abundant in lowlands about San Francisco Bay and southward to Southern California.

5. **R. salicifolius** Weinm. WILLOW DOCK. Commonly tufted, 2 ft. high; leaves $1\frac{1}{2}$ to 5 in. long, plane, glaucous, lanceolate, acute at both ends; flowering branches short (2 or less commonly 4 in. long), the lateral mostly divaricate; whorls dense, crowded, leafless, or 1 or 2 lower whorls remote and leafy; pedicels rather shorter than the fruit, jointed near the base and recurved but not geniculate; inner fruiting sepals triangular or triangular-ovate, pink-red, 1 or 2 lines long, the white callous grains variable in number, smooth or pitted.

Wet places in valley lands, widely distributed. Sometimes called "White Dock" and readily recognized by its whitish willow-leaved foliage.

6. **R. pulcher** L. FIDDLE DOCK. Stem slender but rigid, widely parted into zigzag branches; leaves oblong or fiddle-shaped, 3 to $5\frac{1}{2}$ in. long, petioled; flowering branches simple, divaricate, sparsely leafy, the dense whorls remote or at least distinct, red-brown in fruit; pedicels about equaling the fruit, tumidly jointed in the middle; inner fruiting sepals with 5 to 10 awn-like teeth on each side; callous grains 1 to 3.

Naturalized weed; waysides and vacant lots in towns, common.

7. **R. obtusifolius** L. BITTER DOCK. Tall, slender, 3 ft. high or more; leaves ovate-oblong to oblong-lanceolate, somewhat undulate, acute or obtuse, truncate or cordate at base, 6 in. long or less, long-petioled; flowering branches in a rather strict panicle, leafless or with a few little-reduced leaves at the base; whorls loose, not crowded, the lower remote, pedicels slender, 1 to 2 times as long as the fruit, tumidly jointed toward the base; inner fruiting sepals ovate-deltoid, $1\frac{1}{2}$ to 3 lines long, with 3 to 5 thin triangular or subulate teeth on each side; grain 1 only or with 2 other small ones.

Introduced species in low lands about San Francisco Bay.

8. **R. persicarioides** L. GOLDEN DOCK. Stems soft and fistulous (at least below), prostrate or erect, seldom more than 1 ft. high; herbage yellowish green, minutely pubescent; leaves oblong or lanceolate, truncate or subcordate at base, acute at apex, a little undulate, 2 to 4 in. long, rather short-petioled; flowering branches with scattered subequal leaves, the whorls mostly crowded or the lower remote; pedicels very unequal, tumidly jointed at base; inner fruiting sepals $\frac{3}{4}$ to $1\frac{1}{2}$ lines long, acutely produced at apex with 2 or 3 awn-like teeth on each side; callous grains 3; fruit almost bur-like.—(*R. maritimus* of Bot. Cal.)

Wet places by lakes or streams or in marshy lands.

7. **POLYGONUM** L. KNOTWEED.

Herbaceous or suffrutescent plants, some of them hydrophytes. Leaves entire, alternate, with scarios sheathing stipules ("sheaths"), these entire, ciliate or lacerate. Flowers white, red or greenish, on jointed pedicels. Calyx red, white, or sometimes greenish, in all ours 5-cleft or -parted, the divisions erect in fruit. Stamens 4 to 9. Styles 2 or 3. Achene lenticular or triangular, enclosed in the fruiting calyx. Embryo curved, lying in a groove at an angle of the endosperm. (Greek *polus*, many, and *gonu*, knee, on account of the nodose zigzag stem of many species.)

Flowers in axillary clusters, either widely separated or crowded into a terminal spike-like raceme, with foliaceous bracts; stamens mostly 8, the filaments or some of them often dilated at the base; achene triangular; leaves mostly narrow and lanceolate or linear, jointed upon a very short petiole adnate to the short sheath of the scarious stipules.—Subgenus *AVICULARIA*.

Perennial and more or less suffrutescent.

Flowers several in a cluster, crowded at the ends of the branches; stipules conspicuously lacerate; leaves revolute.....1. *P. paronychia*.

Flowers 1 or 2 in each axil, less crowded; stipules 2-lobed, the lower lobe lacerate; leaves plane2. *P. bolanderi*.

Annuals.

Prostrate; branches leafy to the ends.....3. *P. aviculare*.

Erect; leaves diminishing upwards and becoming bract-like, the branches terminating in more or less loose spikes.....4. *P. spergulariaeforme*.

Flowers spicate, solitary in the axils, the internodes very short; stamens 8; achene triangular; leaves very narrow, not jointed to the lacerate stipule; ours slender wiry brittle annuals.—Subgenus *DURAVIA*.

Plants 3 to 7 in. high; flowers in terminal or axillary spikes.....5. *P. californicum*.

Plants 1 to 2 in. high, flowering even from the base; leaves 1 to 2 lines long.....6. *P. parryi*.

Flowers in dense spike-like racemes (usually geminate or paniculate), with small scarious bracts; calyx 5-parted, appressed to the triangular or lenticular achene; stamens 4 to 8, filaments filiform; leaves ample, not jointed to the petiole.—Subgenus *PERSICARIA*.

Spikes solitary or sometimes 2; flowers red; stamens 5, exserted; achene lenticular; mostly aquatic perennials.

Leaves mostly elliptical or oblong; spikes oblong or ovate, $\frac{1}{2}$ to 1 in. long.....7. *P. amphibium*.

Leaves ovate-lanceolate; spikes more elongated, 1 to 3 in. long.....8. *P. muhlenbergii*.

Spikes several to many, geminate or more or less paniculate; stamens 6 to 8, included; achene either lenticular or triangular.

Sheathing stipules naked in age; spikes often drooping; sepals white or flesh-color; stamens 6; annual.....9. *P. lapathifolium*.

Sheathing stipules fringed with bristles; spikes erect.

Sepals pink, red or greenish; spikes not interrupted; stamens generally 6; annual.

10. *P. persicaria*.

Sepals greenish and glandular-dotted; spikes interrupted; stamens 8; perennial of

marshy places11. *P. punctatum*.

Flowers in loose paniced racemes; stamens 8; achene triangular; leaves cordate; twining plants.—Subgenus *TINIARIA*.

Annual12. *P. convolvulus*.

1. *P. paronychia* C. & S. Stems from large woody rootstocks, suffrutescent, prostrate or ascending, 1 to 3 ft. long; branches leafy above, below clothed with old sheaths; sheaths large, 4 to 6 lines long, brown and 5-nerved, the margin freely lacerate above, persistent, the segments becoming hair-like in age; leaves linear-lanceolate, 5 to 8 (or 11) lines long, acute, the margin revolute; flowers about 3 in an axil, on short pedicels, densely crowded at the ends of the branches in short, more or less leafy spikes; sepals white or rose-color, oblong-ovate, 3 lines long; stamens 8.

Sandy hills near the coast: San Francisco and northward. Sepals centrally and pinnately green-veined, the pinnae tooth-like.

2. *P. bolanderi* Brewer. Stems many, erect, suffrutescent below or arising from a woody taproot, 5 to 10 in. high; sheathing stipules scarious, 2-lobed, the lower lobe finely lacerate, persistent; leaves narrowly linear to subulate, acute or cuspidate, 2 or 3 lines long, not revolute; flowers 1 or 2 in the axils on the branchlets, involucre with a sheath-like scarious bract on the joint of the very short pedicel, $1\frac{1}{2}$ lines long; calyx 5-parted; sepals white or rose-color, with a green midrib, oblong-ovate, slightly spreading; stamens 8 or 9, included.

Rocky outcroppings, exact localities known only in the Napa and Mt. Hood ranges. July-Sept.

3. *P. aviculare* L. WIRE GRASS. YARD GRASS. Stems wiry, minutely striate, prostrate, often several feet long, flowering from the base; herbage glabrous and green; leaves oblong, acute, 3 to 6 lines long; flowers on very short pedicels, 2 lines broad when expanded; calyx cleft, the oblong lobes white with a green center; stamens 8, the 3 inner with dilated bases; styles 3, very short; achene ovoid, dark brown, minutely granular.

Naturalized from Europe: common in hard, especially beaten soils, and sometimes in cultivated lands; flowering through the dry season and until after the rains break.

4. *P. spergulariaeforme* Meisn. Annual, much branched and somewhat diffuse, or sparingly branched and more strictly erect, 4 to 13 in. high; sheaths with a short mostly scarious base and lacerate summit; leaves linear or oblanceolate, 1-nerved, acute, 6 to 13 lines long; spikes 4 in. long or less, very slender, the flowers much scattered below, crowded above; calyx rose-color or white; stamens 8, included, the filaments hardly dilated at base; style as long as the ovary, 3-parted.—(*P. coarctatum* Dougl.)

Dry hills: northern Sonoma Co., Mt. St. Helena, and northward to the Mt. Shasta region. Oct.

5. *P. californicum* Meisn. Annual, 3 to 7 in. high; diffusely branched just above the base, the stems slender and wiry, the ultimate branches elongated and floriferous; herbage glabrous, but the brownish stems striate and minutely scabrous; leaves linear to filiform, cuspidate, 3 to 6 lines long, not jointed to the sheathing stipules which are deeply lacerate-fringed and imbricated on the upper portion of the very slender and elongated spikes; bracts subulate, 1 or 2 lines long; flowers solitary and sessile in each axil; sepals white with rose-colored midvein; achene narrowly lanceolate, slightly exserted; styles slightly divergent.

Dry hills: North Coast Ranges; Sierra Nevada.

6. *P. parryi* Greene. Dwarf compact annual, commonly branching from base, 1 to 2 in. high; stems rigid and brittle, bearing flowers even to the base; leaves narrowly linear, acute, cuspidate, 1 to 2 lines long; stipules so extremely lacerate as to appear cottony, and often hiding the flowers; flowers solitary and sessile in the axils, the bract broad, lacinate to the middle; stamens included; style 3-parted; achene triangular.

Sierra Nevada; higher North Coast Ranges, Howell Mt. and northward.

7. *P. amphibium* L. WATER PERSICARIA. Aquatic glabrous perennial with stout stems not branching above the rooting base; leaves floating, elliptical to oblong or oblong-lanceolate, truncate or rounded at base, 2 to 7 in. long on petioles $\frac{7}{8}$ to $2\frac{1}{2}$ in. long; sheaths leaf-bearing at about the middle; spike terminal, dense, ovate or oblong, $\frac{1}{2}$ to 1 in. long, on a commonly short peduncle; calyx bright rose-color, $1\frac{1}{2}$ to 3 lines long, the 5 stamens and 2-cleft style exserted; achene lenticular, smooth.

Ponds and lakes in the Coast Ranges and Sierra Nevada and also in sloughs of the interior valleys. Far northward and eastward. Often terrestrial and almost equally successful as a land or water plant. Var. *HARTWRIGHTII* Bissel. Differing in its rough-hairy sheaths which are ciliate and usually with an abruptly spreading herbaceous margin.—Sierra Nevada and far eastward (*P. hartwrightii* Gray).

8. *P. muhlenbergii* Wats. Perennial, aquatic or in half dry places; leaves and upper portion of the simple stem appressed-hirsutulose or scabrous, the

peduncle glandular with short hairs; leaves thin, ovate-lanceolate to lanceolate, acuminate or even attenuate, usually rounded at base, 3 to 8 in. long, the petioles 1 to 3½ in. long; spikes 1 to 3 in. long, often in pairs; calyx rose-color or pink, 5-parted to the middle; stamens 5, exserted; style 2-cleft; achene lenticular.

Lakes and sluggish streams from the coast to the Sacramento Valley and far northward and eastward.

9. *P. lapathifolium* L. COMMON KNOTWEED. Annual, commonly stout, 1 to 4 ft. high, branching, glabrous except a very scanty glandular pubescence on the peduncles and a scabrous pubescence on the leaf-margins; leaves broadly lanceolate, attenuate upward from near the base and mostly long-acuminate, cuneate at base and short-petioled, 4 to 5 in. long; spikes axillary and terminal, oblong and erect or linear and nodding, 1 in. long or more; calyx white or flesh-color, 1 line long; stamens 6, included; styles 2 or 3-parted; achene lenticular or rarely triangular.—(*P. nodosum* Pers.)

Common along streams or in marshy lands, often whitening great areas. Aug.-Sept.

10. *P. persicaria* L. LADY'S THUMB. Resembling *P. lapathifolium* but the sheaths and bracts conspicuously ciliate; leaves sub-sessile; spikes shorter and erect; stamens generally 6, included; style 2 or 3-parted.

San Francisco. Widely distributed in North America and the Old World.

11. *P. acre* H.B.K. DOTTED SMART-WEED. Perennial, rooting and decumbent at base, erect and branching above, 2 to 5 ft. high, glabrous or the margin of the leaves scabrous; leaves lanceolate to linear-lanceolate, acuminate, attenuate to a very short petiole, 2 to 3 in. long; sheaths and the short bracts mostly bristly-ciliate; inflorescence a panicle of spike-like racemes, these loose and filiform, 1 to 3 in. long, erect on long peduncles; calyx greenish, conspicuously glandular, 5-parted, 1 line long; stamens 8, included; styles 2 or 3-parted to the base; achene lenticular or triangular.—(*P. punctatum* Ell.)

Common in low and especially marshy ground or in moist mountain meadows. Sept. An important bee-plant along the Sacramento River (Yolo and Colusa cos.), the honey yield as heavy as from alfalfa (M. C. Richter).

12. *P. convolvulus* L. BLACK BINDWEED. Twining or trailing, the stems 1 to several ft. long; herbage glabrous, pale green; leaves 1 to 2 in. long, ovate, sagittate at base, acuminate at apex; flowers either in axillary clusters or disposed in a raceme; calyx 5-cleft, in fruit minutely scurfy and closely investing the black achene which is 2 lines long.

Introduced from Europe; region of Mt. Shasta; San Francisco.

CHENOPODIACEAE. GOOSEFOOT FAMILY.

Herbs or shrubs, mostly halophytes, very often succulent or scurfy, with alternate or rarely opposite leaves, or leafless. Flowers small (1 or 2 lines long), perfect or unisexual with an herbaceous calyx of 5 or fewer sepals, or in the pistillate flower the calyx sometimes absent. Stamens as many as the sepals, and opposite them or fewer, distinct. Ovary superior, 1-celled, containing a single ovule, becoming in fruit an achene or utricle. Styles or stigmas 2 or 3. Embryo annular and surrounding the mealy endosperm, or spiral and the endosperm lateral or wanting. *Nitrophila* has a scarious calyx and stamens not distinct.

A. Stems leafy.**1. Leaves all opposite.**

flowers perfect; stamens united at base into a perigynous disk.....1. *NITROPHILA*.

2. Leaves all or mostly alternate.

Leaves plane, membranous or fleshy.

Flowers perfect; calyx 5-cleft or -parted.

Ovary partly inferior.....2. *BETA*.

Ovary superior.....3. *CHENOPODIUM*.

Flowers perfect or pistillate; calyx urceolate, 3 to 5-toothed.....4. *ROUBIEVA*.

Flowers unisexual; staminate calyx 4 or 5-parted; calyx of fertile flower none, the pistil enclosed by 2 bracts.....5. *ATRIPLEX*.

Leaves subterete, linear; flowers perfect or gyno-monoecious.....8. *SUAEDA*.

B. Stems with the leaves reduced to mere scales.

Flowers perfect, immersed by 3s in the depressions of a fleshy cylindrical spike and

Spirally arranged; calyx 4 or 5-cleft; shrub with fleshy jointed alternate branchlets...6. *SPIROSTACHYS*.

Decussately opposite; calyx bladder-like; herbs with stout fleshy jointed stems.....7. *SALICORNIA*.

1. *NITROPHILA* Wats.

A low perennial glabrous herb with fleshy opposite amplexicaul leaves and axillary perfect flowers. Calyx of 5 (rarely 6 or 7) equal erect concave and carinate sepals. Stamens equal in number, united at base into a narrow yellowish disk. Style longer than the sub-globose ovary; stigmas 2. Utricle 1-seeded, indehiscent, beaked by the persistent style, included within the connivent sepals. (Greek nitron, carbonate of soda, and philos, fond of, these plants loving alkaline soils.)

1. *N. occidentalis* Wats. Stems decumbent, oppositely branching, 4 to 14 in. long; root about the size of a pencil, penetrating vertically (and often maintaining a uniform size) to a depth of 2 ft. or more; leaves linear, sessile, $\frac{1}{2}$ to 1 in. long, the floral mostly 3 to 6 lines long, triangular, mucronate; flowers solitary in the axils of the opposite leaves and bibracteate, or often 2 to 3 with the central one frequently bractless and the lateral often pedicellate; sepals imbricated, pinkish or whitish, chartaceous, 1 line long; stamens $\frac{1}{4}$ the length of the sepals and opposite them; ovule attached to base of ovary on a long funiculus.

Moist alkaline areas, often on the black alkali: lower Sacramento, more common southward through the San Joaquin.

2. *BETA* L.

Robust glabrous biennials with large fleshy roots and alternate leaves, the radical large and long-petioled, the floral reduced and sessile. Inflorescence spicate. Flowers perfect, greenish white, in sessile axillary clusters, these forming spikes disposed in a leafy panicle. Sepals 5, sometimes costate dorsally. Stamens 5, opposite the sepals, perigynous; filaments frequently connate at base. Ovary sunk in the succulent base of the perianth and partly inferior; styles 2 or 3, short, stigmatose on the inside. Fruit included in the at length much indurated calyx. Embryo annular. (Perhaps Celtic, bett, red, on account of the color of the root.)

1. *B. vulgaris* L. BEET. Root biennial, $1\frac{1}{2}$ to 2 in. in diameter, 3 to 6 in. long, tapering downwards; stems stout, 2 to 4 ft. high, paniculately branched above; leaves 6 to 9 in. long, oblong or oval, undulate; cauline smaller, ovate-lanceolate; seed rugose.

Marshes at Alvarado; Petaluma. An escape from gardens. June.

3. CHENOPODIUM L. GOOSEFOOT. PIGWEED.

Annual or perennial herbs, frequently white-mealy or glandular, with alternate petioled leaves. Flowers perfect, greenish, bractless and sessile, clustered in axillary or terminal spikes. Spikes often panicled. Calyx 5 (or 3 to 4)-parted, the lobes usually somewhat carinate or in fruit crested, and commonly completely covering the seed-like achene. Stamens 5 or fewer. Ovary depressed; styles 2, rarely 3 or 4, slender. Pericarp membranous, closely investing the seed. Embryo annular, sometimes incompletely so. (Greek chen, goose, and pous, foot, on account of the shape of the leaves.)

Annual; calyx parted into lobes or segments.

Finely mealy, not pubescent or glandular; perianth dry, closely persistent on the seed; embryo annular.

Erect, herbage light green.....1. *C. album*.

Diffuse, herbage dark green2. *C. murale*.

Not mealy, glandular-pubescent and aromatic, fruit seed-like, small, included in the dry perianth; embryo curved.

Leaves slender-petioled; fruit imperfectly enclosed; spikes cymose-diverging, leafless.

3. *C. botrys*.

Leaves slightly petioled; fruit perfectly enclosed.

Spikes dense, leafy.....4. *C. ambrosioides*.

Spikes more elongated, leafless.....5. *C. anthelminticum*.

Neither glabrous nor mealy; flowers in dense short axillary spikes; perianth more or less fleshy in fruit, enclosing the utricle; embryo annular.....6. *C. rubrum*.

Perennial; calyx merely toothed or cleft, more distinctly synsepalous, in fruit dry;

leaves broadly triangular; spike terminal, leafy only below; fruit seed-like, exserted;

embryo annular7. *C. californicum*.

1. *C. album* L. PIGWEED. WHITE GOOSEFOOT. Commonly 2 to 4 ft. high, erect, usually paniculately branched; herbage more or less light green or white-mealy; leaves rhombic-ovate, sinuate-dentate below or about the middle, the uppermost varying to lanceolate, and subentire, 1 to 2 in. long, whiter beneath than above; flowers densely clustered in close spikes, the panicle strict and close or somewhat spreading; calyx about $\frac{3}{4}$ line wide in fruit, the lobes strongly carinate.

Common European weed in half cultivated lands, flowering in late summer and early autumn.

2. *C. murale* L. NETTLE-LEAF GOOSEFOOT. Rather stout and succulent, the loose branches decumbent and ascending, 8 to 15 in. long; herbage dark green, the growing parts very finely mealy; leaves rhombic-ovate, irregularly and sharply toothed above the base, 1 to $1\frac{3}{4}$ in. long; flowers in rather dense axillary or terminal spicate panicles; panicles leafless, or nearly so; fruiting calyx closed; seed acutely margined.

Naturalized from Europe; a common weed in old yards and waste places, flowering through the winter.

3. *C. botrys* L. JERUSALEM OAK. Glandular pubescent and viscid throughout; leaves slender-petioled, ovate to oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, obtuse, truncate or cuneate at base, sinuately pinnatifid and the lobes usually toothed; spikes cymose, diverging, loose, leafless; calyx not completely enclosing the fruit.

Waste places near dwellings and in stream beds; naturalized from Europe and widely distributed but not common. July-Sept.

4. *C. ambrosioides* L. MEXICAN TEA. Glabrous, scarcely glandular; when young sometimes tomentose-pubescent; 2 to $3\frac{1}{2}$ ft. high, usually stout and branched; leaves slightly petioled, oblong or lanceolate, 2 to 5 in. long, repand-toothed or nearly entire, the upper tapering to both ends; flowers in

dense, axillary clusters upon the branches, forming a leafy spike; calyx-lobes obtuse, appressed; styles 3, sometimes 4; pericarp deciduous.

Common near salt marshes and abundant along interior streams; mostly autumnal. Alameda; Berkeley; Marin Co.; Napa Valley; Suisun Marshes; Sacramento River.

5. *C. anthelminticum* L. WORMSEED. Resembling the preceding; sometimes perennial (?); herbage light green, glandular-puberulent and highly aromatic; leaves sinuate-serrate or the lower sometimes lacinate-pinnatifid, $2\frac{1}{2}$ or mostly 1 in. long, or less; inflorescence a terminal mostly leafless panicle of dense but elongated slender spikes; sepals not carinate, enclosing the fruit; seed smooth and shining, obtusely margined.

Not so common as the last, but appearing to hybridize with it. Alameda; Benicia; lower Sacramento; Lake Co.

6. *C. rubrum* L. COAST BLITE. Stem angled, erect, 1 to 2 ft. high; herbage green or nearly so; leaves lanceolate-oblong to broadly ovate, coarsely sinuate, 1 to 2 in. long; flowers numerous in dense short axillary spikes; calyx-lobes 2 to 4, rather fleshy; stamens 1 to 2; seeds shining, the margin acute.

Sparingly naturalized from Europe. Lower Sacramento River; Alvarado Marshes. Sept.

7. *C. californicum* Wats. SOAP PLANT. Stout, erect or decumbent at base, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high from a very large root; herbage green, scarcely at all mealy; leaves broadly triangular, truncate or cordate at base, or sub-hastate, sharply and unequally sinuate-dentate, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long; flowers in dense clusters of 8 or 9, the clusters disposed in a simple terminal spike, leafless or leafy at the very base; calyx campanulate, barely exceeding 1 line; fruit with persistent pericarp, seedlike, large, subglobose or somewhat compressed, exserted, $\frac{3}{4}$ to 1 line broad; embryo completely annular.

Foothill country from the Sacramento Valley and Napa Co. southward. Apr.-May.

4. ROUBIEVA Moq.

Heavy-scented herb, with prostrate branches. Leaves alternate, deeply pinnatifid. Flowers minute, perfect or pistillate, solitary or 2 or 3 together in the axils; calyx deeply urceolate, 3 to 5-toothed, becoming saccate and contracted at the top, enclosing the fruit. Stamens 5, included. Ovary glandular at the top; styles 3, somewhat lateral, exserted. Pericarp membranaceous, glandular-dotted, thin and deciduous; seed vertical, lenticular; embryo annular. (G. J. Roubieu, French botanist.)

1. *R. multifida* Moq. Branches 1 to 2 ft. long; leaves $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; calyx in fruit obovate, very conspicuously reticulate-veined.—(*Chenopodium multifidum* L.)

Native of Peru; abundant on the San Francisco sand hills, and in waste places eastward to the Great Valley.

5. ATRIPLEX L.

Herbs or shrubs, usually mealy or scurfy with bran-like scales. Leaves alternate or opposite. Flowers monoecious or dioecious, in clusters, or mostly short spikes which are either simple or panicle, the pistillate and staminate in separate inflorescences or mingled in the same cluster (androgynous); staminate with a regular 4 or 5-parted calyx, the pistillate consisting of a

pistil enclosed between a pair of appressed foliaceous bracts, without perianth. Stigmas 2. Bracts either free or united, much enlarged in fruit, the margin becoming more or less dilated or foliaceous and the sides thickened, indurated, muricate or variously appendaged. (The ancient Latin name of these plants, derived originally from the Greek.)

A. Annuals.

Somewhat succulent and mealy; leaves petioled, the lower at least 1 in. long; bracts distinct or nearly so, ovate to rhombic.

Leaves mostly lanceolate; fruiting bracts 4 to 6 lines long.....1. *A. patula*.

Leaves triangular-hastate or deltoid; fruiting bracts $1\frac{1}{2}$ to 2 lines long.....2. *A. hastata*.

Leaves triangular-ovate; fruiting bracts 1 line long.....3. *A. spicata*.

Not succulent; leaves less than 1 in. long (except no. 7); bracts more or less united and indurated and nut-like in fruit, the sides smooth, toothed or appendaged.

Prostrate, decussately branched throughout; leaves mostly less than $1\frac{1}{2}$ lines long....

4. *A. depressa*.

Erect or ascending, not decussately branched throughout.

Leaves cordate-ovate, sessile.....5. *A. cordulata*.

Leaves oblong-lanceolate to ovate, short petiolate or mostly sessile.....6. *A. coronata*.

Leaves broadly or deltoid-ovate, the lower petiolate; plant 2 to $3\frac{1}{2}$ ft. high.....

7. *A. expansa*.

B. Perennials.

Interior species of alkaline flats.

Diffuse; leaves mostly dentate.....8. *A. bracteosa*.

Erect and rather rigid; leaves entire.....9. *A. fruticulosa*.

Seaboard species.

Stems prostrate, wiry; fruit bracts membranous, compressed.....10. *A. californica*.

Stems reclining, stout; fruiting bracts spongy, globose.....11. *A. leucophylla*.

1. *A. patula* L. SPEAR ORACHE. Stout and succulent, erect, 10 to 18 in. high, with few ascending branches; herbage green, only the growing parts somewhat mealy; leaves (the lowest often opposite) lanceolate or linear, sometimes with hastate base; inflorescence more or less leafy at base; bracts rhombic-ovate, thick and subcoriaceous, 4 to 6 lines long or more.

Salt marshes about San Francisco Bay; common.

2. *A. hastata* L. FAT-HEN. Rather slender, with long (1 to $2\frac{1}{2}$ ft.) ascending branches; herbage mealy, scarcely succulent; leaves triangular-hastate or deltoid, entire or sinuate-dentate, 1 to 2 in. long, often as broad or broader, on petioles 3 or 4 lines long; flowers in dense terminal and lateral spikes 1 (or 2) in. long; fruiting bracts triangular ovate, $1\frac{1}{2}$ (or 2) lines long.

Common at the edges of salt marshes about San Francisco Bay. Bracts very variable as to size and either much or little toothed, or entire. Lateral angles of the deltoid leaves often prolonged into salient lobes.

3. *A. spicata* Wats. Annual, erect, 12 to 16 in. high; herbage scurfy, the stem below glabrate; leaves triangular-ovate, $\frac{1}{2}$ to 1 in. or more long, irregularly dentate or entire, cuspidate, on petioles 1 to 6 lines long; inflorescence a panicle of spikes; flowers androgynous; spikes dense (sometimes loose), $\frac{1}{2}$ to $3\frac{1}{2}$ in. long; staminate calyx 4-sepalous; bracts of pistillate flowers nearly concealed by the male flowers, ovate, acute, coherent at base, free at apex, in fruit little enlarged and about 1 line long.

Low alkaline tracts of the interior valleys: Willows; Solano Co.; Livermore. Occasionally exhibits a tendency to become dioecious. Var. *LAGUNITA* Jepson. Very slender, simple, 5 to 8 in. high; fruiting bracts $1\frac{1}{2}$ lines long.—Lagoon Valley.

4. *A. depressa* Jepson. Annual, prostrate, grayish-scurfy; stems slender, 1 to 4 in. long, decussately branched throughout; leaves opposite, sessile, broadly ovate, acute, a line or two long; flowers in the axils of the opposite leaves,

commonly 2 staminate and 2 pistillate in each cluster, these and the subtending leaves crowded on the branchlets, the internodes at time of flowering a line long or less; fruiting bracts ovate-hastate, acute, wingless, or the pair of hastate lobes representing the wing.

Low saline spots, base of the Pelejo Hills, Solano Co.

5. **A. cordulata** Jepson. Annual; widely and oppositely branched at base, alternately and sparingly so above, 7 to 15 in. high, the branches commonly virgate, erect or ascending; herbage scurfy throughout; leaves sessile, cordate-ovate, 3 or 4 lines long; flower-clusters in all the axils, consisting of both staminate and pistillate flowers; calyx tomentosely-scurfy and deeply 4-cleft; fruiting bracts semi-orbicular, $1\frac{1}{2}$ to 2 lines broad, much compressed, sessile or short-stipitate, the margin with acute teeth, the terminal tooth commonly the largest, the sides smooth or the lower bearing one or more tooth-like projections.

Alkaline flats: lower Sacramento Valley; San Joaquin Valley.

6. **A. coronata** Wats. Annual, 3 to 12 in. high, sometimes rather stout, white-scurfy throughout; branches simple or nearly so, two or three pairs opposite at base, the upper alternate; leaves oblong-lanceolate or ovate, sessile, 3 to 8 lines long; flowers androgynous in the axils of the leafy stems, two or three in a cluster; calyx deeply 4-cleft; stamens 4; fruiting bracts orbicular, compressed, 2 lines long, the margins crenate-dentate, the sides rarely muriculate.—(*A. coronata* var. *verna* Jepson.)

Saline flats: Solano Co. southward to Santa Clara Co. May-June.

7. **A. expansa** Wats. Annual, erect, much branched, 2 to $3\frac{1}{2}$ ft. high; herbage closely and finely mealy-scurfy; leaves broadly ovate or deltoid-ovate, irregularly and sharply sinuate-toothed, 1 to 3 in. long, the lower on stout petioles 9 to 10 lines long and strongly 3-nerved from the base, the upper reduced to sessile and more or less cordate floral bracts as broad as (or broader than) long; flower clusters androgynous or showing a tendency to become unisexual; fruiting bracts numerous, clustered in the axils, sessile, orbicular, mostly 3-nerved, 2 lines long, $2\frac{1}{3}$ to 3 lines broad, usually emarginate at apex, the wing sharply toothed, partly distinct, and commonly bearing on one face a few irregular projections or crests.

Low alkaline areas of the interior: lower Sacramento Valley; San Joaquin Valley, where abundant.

8. **A. bracteosa** Wats. Perennial, more or less diffuse, with stems 1 to several ft. long; branches smooth and shining, straw-yellow; foliage finely grayish scurfy; leaves oblong-ovate, acute, 4 to 9 lines long, thin, sharply but sparingly toothed or the smaller entire; flower clusters unisexual, the staminate in terminal submoniliform spikes, the pistillate axillary; fruiting bracts a line long, the margin laciniately toothed or simply dentate and the central tooth lanceolate and conspicuous.

Saline flats: lower Sacramento Valley; San Joaquin Valley.

9. **A. fruticulosa** Jepson. Herbaceous or slightly suffrutescent perennial; stems several from the base, erect, simple below, with terminal branchlets, 6 to 13 in. high; herbage grayish; leaves sessile, lanceolate or narrowly oblong, $\frac{1}{4}$ to $\frac{3}{4}$ in. long; staminate flowers in dense globose clusters 2 lines in diameter, the clusters in a terminal simple or sometimes slightly branched spike, naked or nearly so; pistillate chiefly below, from the leaf axils; fruiting bracts orbicular, $1\frac{1}{2}$ to 2 lines broad, the margins partly free, the sides tooth-crested.

Alkaline flats of the Sacramento and San Joaquin valleys. Abundant on the "goose-lands" of Glenn Co.

10. *A. californica* Moq. Perennial; root large, $\frac{1}{2}$ to 1 in. thick, somewhat fleshy; stems slender, wiry, mostly herbaceous, prostrate, often much branched and forming a thick mat; herbage finely white-mealy, but the general hue mostly greenish; leaves thinnish, ovate-lanceolate to oblong-lanceolate, 2 to 6 lines long, sessile, or narrowed at base into a very short petiole; staminate flowers in terminal spikes; pistillate flowers in axillary clusters; fruiting bracts membranous, ovate, acute, entire, loosely closed over the utricle, but not united, $1\frac{1}{2}$ lines long or less.

Sandy beaches along the ocean and about San Francisco Bay. Apr.-May.

11. *A. leucophylla* Dietr. Perennial; stems prostrate, densely light brown-scurfy, 1 to several ft. long, often somewhat woody at base, with usually many short ascending branches; leaves thick, orbicular to elliptic or elliptic-ovate, 4 to 8 lines long, sessile, 3-nerved; calyx rather large, 5-lobed; staminate clusters in a dense terminal spike $\frac{1}{2}$ to 1 in. long; pistillate flowers 2 or 3 together in axillary clusters; fruit globose or nearly so, $1\frac{1}{2}$ to 2 lines long, with the bracts completely united and marginless (except at the apex where there is a small ovate double wing) and the sides commonly with two (or several) warty projections.

Seabeaches, very common; San Francisco and southward.

6. SPIROSTACHYS Wats.

An alkaline shrub with alternate leafless jointed branches; the branchlets fleshy and green with short scale-like leaves. Flowers perfect, arranged spirally by threes in a crowded spike, in the axils of fleshy subsessile bracts. Calyx of 4 (or 5) concave carinate imbricated sepals, more or less united. Stamens 1 or 2, with slender filaments at length exerted. Ovary oblong; styles 2, rarely 3, commonly distinct. Pericarp membranous, free from the vertical oblong seed. Embryo green, nearly surrounding the rather copious albumen. (Greek *spira*, a coil or spiral, and *stachys*, a spike.)

1. *S. occidentalis* Wats. KERN GREASEWOOD. Erect, diffusely branched, 4 ft. high or less; vestiges of leaves very short, broadly triangular and amplexicaul, acute, often nearly obsolete; spikes numerous, sessile or nearly so, cylindrical, 3 to 10 lines long; bracts rhomboidal; flowers crowded, slightly exerted; calyx becoming spongy and enclosing the fruit.—(*Allenrolfea occidentalis* Ktze.)

Alkaline soil: Byron Springs and Livermore Pass to the upper San Joaquin.

7. SALICORNIA L. SAMPHIRE. GLASSWORT.

Low saline very succulent plants, ours herbs, with leafless jointed stems and opposite branches. Inflorescence spicate-cylindrical. Flowers perfect, immersed in the hollows of the thickened upper joints, and disposed in opposite clusters of 3, the lateral ones of each trio often only staminate. Calyx small and bladder-like, with an anterior opening, in fruit spongy or thickened on the margins. Stamens 2, exerted in flower. Ovary oblong; styles 2 or 3, short. Pericarp membranous, in our species adherent to the vertical seed. Embryo thick, the cotyledons incumbent upon the caulicle. (Latin *sal*, salt, and *cornu*, horn, plants of saline habitat with horn-like branches.)

1. *S. ambigua* Michx. PICKLE-WEED. Stems 5 to 12 in. long, from

woody rootstocks, erect, or decumbent and rooting at the joints; herbage greenish.

Very abundant in salt marshes about San Francisco and Suisun bays.

8. *SUAEDA* Forsk. SEA BLITE.

Fleshy plants of salt marshes or alkaline plains, with alternate subterete linear leaves. Flowers perfect, or perfect and pistillate on the same plant, sessile in the axils of the leafy bracts, minutely bracteolate; calyx with 5 lobes, fleshy, enclosing the utricle and mostly carinate or crested. Stamens 5. Styles 2 or 3, short and rather thick. Seed with a dark, shining crustaceous testa and a spiral embryo. (Name from the Arabic.)

Succulent, woody only at base; branches decumbent, with ascending branchlets; flowers 1 to 3 in the axils.....1. *S. californica*.
Mostly suffrutescent, with erect main stem and ascending branches; flowers 3 to 7 in the axils2. *S. torreyana*.

1. *S. californica* Wats. Glabrous and slightly glaucous; main stem or woody trunk short, giving rise to decumbent branches 3 to 9 ft. long, these woody for 1 or 2 ft., then succulent, bearing ascending or erect branchlets $\frac{1}{2}$ to 1 ft. long, and forming low circular plants 6 to 12 ft. in diameter; leaves spreading or somewhat recurved, densely crowded upon the branchlets, broadly linear, acute, 6 lines long; flowers large, 2 lines broad, 1 to 3 in the axils, when 3 the central one perfect, the 2 lateral smaller and pistillate; seed jet-black.

Sandy beaches bordering San Francisco Bay, the known stations few: San Pablo Landing; Bay Farm Island. Sept.-Oct. Ovary glabrous, surmounted by a short thick column, the styles arising from the concavity of the cup-shaped summit of the column.

2. *S. torreyana* Wats. ALKALI BLITE. Of bushy but irregular habit, woody at base, about 2 ft. high; herbage greenish; leaves not dense, 5 to 7 lines long, mostly acute; clusters several (mostly 3 to 7)-flowered; calyx fleshy, 5-parted, the stamens included; ovary as in no. 1.

Alkaline soil: Livermore Pass and southward through the San Joaquin.

S. SUFFRUTESCENS Wats. Compact symmetrical bush of about equal diameter and height, 6 to 15 (or 18) in. high, the woody base short; herbage gray with a dense soft pubescence; flowers 1 (rarely 2 or 3) in each axil; calyx 5-lobed, dryish, the stamens exserted; ovary woolly; styles not arising from a cup-shaped concavity.—Alkaline plains, western Madera Co., *H. L. Westover*, and southward.

SALSOLA KALI L. var. *TENUIFOLIA* G. F. W. Mey. Russian Thistle. Bushy annual; leaves filiform, spiny; flowers solitary and axillary, sessile, perfect, with 2 bractlets; calyx usually rose-color, 5-parted, its divisions at length horizontally winged on the back, the wings forming a broad scarious border.—Obnoxious weed, sparingly introduced. First appeared in Antelope Valley near Lancaster (about 1890), Bakersfield (1895), Antioch (1900) and Stanislaus Co. (1903). Also in the Salinas Valley, *Hickman*. A "tumble-weed," called by the Russians "wind-witch."

PHYTOLACCA DECANDRA L., Pokeweed, belongs to the Phytolacaceae. Tall perennial herb with reddish purple stems, alternate entire thin petioled leaves and flowers in racemes; sepals 5, petal-like, white, rounded, $2\frac{1}{2}$ lines long; stamens 5 to 30; ovary lobed, several-celled, the styles as many as the cells; fruit a dark crimson or purple berry which is poisonous.—Lake Co., naturalized from the Eastern United States.

AMARANTACEAE. AMARANTH FAMILY.

Annual or perennial herbs with simple entire leaves without stipules. Flowers small, usually greenish, inconspicuous, perfect or unisexual. Calyx of 3 to 5 sepals, or sometimes only 1, always persistent and more or less scarious. Corolla none. Stamens 5, sometimes fewer. Ovary superior, 1-celled, with 2 or 3 stigmas. Fruit a utricle or bursting irregularly or circumscissile. Embryo curved.

AMARANTHUS L. AMARANTH.

Coarse annual weeds with petioled leaves and small green or sometimes purplish regular flowers, disposed in axillary or terminal spikes or clusters. Flowers polygamous or monoecious, with bractlets at base, staminate and pistillate flowers commonly in same cluster. (Greek *a-*, not, and *marino*, to fade, the spikes of certain species retaining their color in drying.)

Fruit dehiscent, the top falling away as a lid.

Flowers in dense terminal and axillary spikes; sepals 5..... *A. retroflexus*.

Flowers in small axillary clusters or spikelets.

Sepals 3; plant erect, bushy-branched.....2. *A. graecizans*.

Sepals 3, or in the fertile flower 1; stems prostrate or ascending....3.. *A. californicus*.

Fruit indehiscent; sepals 3; plant prostrate.....4. *A. deflexus*.

1. ***A. retroflexus* L. ROUGH PIGWEED.** Stoutish, commonly branched from the base, 1 to 3 ft. high; herbage dull green, roughish or pubescent; leaves from rhombic to oblong-ovate, petioled; flowers green, densely crowded in erect or slightly spreading axillary and terminal spikes, 1 to 1½ in. long; bracts lanceolate-subulate, scarious, except the green carinate midrib, 1½ to 3 lines long; sepals 5, oblong-lanceolate, cuspidate, 1 line long or less; fruit circumscissile; seed rather less than ½ line broad, black and shining.

Very common in uncultivated orchards, gardens and waste lands. Introduced from tropical America.

2. ***A. graecizans* L. TUMBLE WEED.** Herbage light green; stems freely and rigidly branching, 1 to 3 or 4 ft. high, commonly of bushy outline; leaves small, oblong-spatulate or obovate; flowers in clusters in short axillary spikelets; bracts subulate 1 to 2½ lines long; sepals 3, oblong-lanceolate, shorter than the somewhat rugose utricle.—(*A. albus* L.)

Summer weed; extremely abundant in cultivated fields. The plant becomes rigid when dead and dry, and when loosened by fall winds is carried across the fields, the seeds being thus effectively dispersed.

3. ***A. californicus* Wats.** Stems stoutish or rather fleshy, prostrate or ascending, branching at the base, with numerous short branchlets; leaves obovate to oblong, often with white veins and margin, 1 in. long or less, including the petiole; flowers green or reddish in many small axillary clusters; sepals 3, or in the pistillate or fertile flower 1; bracts often inconspicuous, shorter than or a little exceeding the utricle; utricle somewhat rugose, at length circumscissile.

Moist soils. South Coast Ranges.

4. ***A. deflexus* L.** Stems slender, prostrate, 1 to 1½ ft. long; leaves rhombic-ovate; flowers in shorter spikelets clustered in axils of leaves or disposed in dense terminal spikes 1 in. long or more; sepals 3

Introduced from southern Europe; gardens at Berkeley; Petaluma.

NYCTAGINACEAE. FOUR-O'CLOCK FAMILY.

Ours succulent herbs with opposite entire petioled leaves and swollen joints. Flowers perfect, delicate. Involucre of several distinct bracts subtending a

many-flowered head, or calyx-like and containing 1 to many flowers. Corolla none. Calyx tubular, colored like a corolla, 4 to 5-lobed, its persistent base constricted over the 1-celled 1-seeded superior ovary, forming a hardened pericarp-like covering to the achene. Stamens 3 to 5, slender, hypogynous or perigynous. Embryo coiled, with broad foliaceous cotyledons, the endosperm in the center.

1. ABRONIA Juss.

Ours perennial seaside herbs with viscid herbage. Peduncles axillary or terminal, bearing a many-flowered head subtended by 5 to 15 distinct involueral bracts. Flowers showy. Calyx-tube elongated, its spreading limb 5-lobed, the lobes emarginate. Stamens commonly 5, unequal, included in the tube and adnate to it. Style included. Persistent base of calyx indurated, 3 to 6-winged, more or less reticulate, enclosing a cylindrical achene. Embryo with one cotyledon. (Greek abros, graceful.)

Calyx rose-purple; wings of the fruit thin but solid.....1. *A. umbellata*.
Calyx yellow; wings thicker, the central cavity of the fruit extending through them....
2. *A. latifolia*.

1. *A. umbellata* Lam. COMMON SAND-VERBENA. Stems slender, prostrate, viscid, 1 to 3 ft. long; leaves nearly glabrous, roundish or ovate to narrowly oblong, the margin often somewhat sinuate, 1 to 1½ in. long, narrowed at base to a slender petiole; heads 10 to 15-flowered, peduncles 2 to 6 in. long; involueral bracts narrowly lanceolate, 2 or 3 lines long; calyx rose-purple, 6 to 8 lines long; fruit rigid and hard, oblong, attenuate at each end, 4 to 5 lines long.

Common on the whole California seacoast. June-Oct.

2. *A. latifolia* Esch. YELLOW SAND-VERBENA. Stems stout, 1 to 2 ft. long, prostrate, only the leaves and flowering peduncles ascending or erect; herbage very succulent; leaves broadly ovate to suborbicular and broader than long, truncate or reniform at base, ½ to 1½ in. long; peduncles usually exceeding the leaves; bracts 5, broadly ovate, 2 lines long; flowers somewhat fragrant; calyx yellow, 6 lines long; fruit coriaceous, 4 to 6 lines long, acute at each end.

Common along the seashore from Monterey northward. May-Nov.

AIZOACEAE. CARPET-WEED FAMILY.

Ours prostrate or decumbent herbs. Flowers perfect and regular, either solitary or clustered. Calyx 4 or 5-lobed or -parted, either free from or more or less adnate to the ovary. Stamens hypogynous or commonly perigynous, fewer than the sepals or more numerous. Fruit a loculicidal or circumscissile capsule or indehiscent.

Calyx free from the ovary; petals none; leaves opposite.

Capsule loculicidal, 3-valved; sepals 5; ovary 3-celled.

Stamens 3 to 5; herbage glabrous.....1. MOLLUGO.

Stamens 5 to 10; herbage soft-pubescent.....2. GLINUS.

Capsule circumscissile; calyx 5-cleft.

Stipules scarious, lacinate; ovary 1-celled; stamens 1 to 3.....3. CYPSELEA.

Stipules none; ovary 3 to 5-celled; stamens numerous.....4. SESUVIUM.

Calyx adnate to the ovary.

Petals none; leaves alternate, plane; fruit indehiscent.....5. TETRAGONIA.

Petals numerous; leaves opposite, 3-sided and very fleshy; fruit dehiscent.....
6. MESEMBRYANTHEMUM.

1. MOLLUGO L. CARPET WEED.

Low glabrous much-branched annuals with whorled leaves and obsolete stipules. Flowers axillary, on slender pedicels. Sepals 5, scarious-margined, white within, thus resembling petals when expanded, persistent. Petals none. Sta-

mens 5, hypogynous and alternate with the sepals, or 3 and alternate with the cells of the ovary. Stigmas 3. Capsule 3-celled, 3-valved, loculicidally dehiscent, the partitions breaking away from the many-seeded axis. (Ancient Latin name for some soft plant.)

1. *M. verticillata* L. INDIAN CHICK-WEED. Prostrate, forming patches, not fleshy; leaves obovate or spatulate, entire, clustered in whorls of 5 or 6, unequal, 7 lines long or less; flowers several at each node; sepals oblong; capsule ovoid, scarcely exerted from the calyx; seeds reniform, shining, nearly smooth, obviously striate, crowded in the capsule and irregularly distending its walls, which are thus roughened.

Sparingly naturalized from Mexico: Russian River (Healdsburg, *Alice King*, 1897, to Duncan Mills, *Davy*, 1896); Orange Co., acc. Abrams, 1904; Los Angeles, *Davidson*, 1893; Princeton, *Chandler*, 1905; Newcastle (*Zoe*, iv, 152); upper Sacramento, *Brewer*, 1862; Stillwater (Shasta Co.), *M. S. Baker*, 1898.

2. GLINUS L.

Annual herbs with whorled petioled leaves; very near Mollugo. Flowers pedicelled in dense glomerules in the upper axils. Stamens 5 to 10 or more. Seeds with a strophiole, the funiculus very long and slender. (Greek name of Theophrastus for a maple, application to this genus unknown.)

1. *G. lotoides* L. Diffusely branched from the base, the stems 4 to 8 in. long, procumbent or ascending; leaves 3 to 6 lines long, orbicular to obovate, rounded at apex or abruptly acute, at base narrowed to a slender petiole; flowers 2 lines long; seeds blackish, granulated.

Naturalized from Europe: Lathrop, *Mrs. K. Brandegee*; Chico, *Parry*; Lakeport (*Zoe*, iv, 153).

3. CYPSELEA TURP.

Inconspicuous prostrate annual with opposite leaves and scarious laciniate stipules. Tube of calyx short, campanulate, the lobes (in ours) 5, ovate, unequal. Petals none. Stamens 1 to 3. Ovary superior, 1-celled; style 2-cleft. Fruit a subglobose circumscissile capsule. Seeds minute, smoothish, the funiculi persistent on the central placenta. (Greek kupsele, a beehive, which the capsule is thought to resemble.)

1. *C. humifusa* Turp. Stems much branched and matted, the plants 1 or 2 in. broad; leaves 2 to 6 lines long, oblong or elliptical, obtuse, the petioles slender, nearly as long as the blade, those of each pair very unequal; stamens 3, rarely 1, inserted opposite the sinuses.

West Indian plants naturalized in low lands: lower San Joaquin; Aptos, *Parry*. Aug.

4. SESUVIUM L.

Fleshy decumbent or prostrate herbs with opposite leaves and no stipules. Flowers solitary in the axils, sessile or shortly pediceled. Calyx-tube turbinate, the lobes 5, purplish, oblong, obtuse. Petals none. Stamens (in ours) numerous, inserted on the calyx, united by their filaments into sets. Ovary 3 to 5-celled, with as many separate styles. Capsule membranous, the upper part falling off as a lid. Seeds smooth. Embryo annular.

1. *S. sessile* Pers. LOWLAND PURSLANE. Stems prostrate, freely branching, 1 to 3 ft. long; herbage finely warty; leaves broadly spatulate, $\frac{3}{4}$ to 2 in. long; flowers 4 to 5 lines long; sepals ovate-lanceolate, commonly acuminate, 3 lines long; filaments united for about one-half their length.—(*S. portulacastrum*, Bot. Cal.)

River lowlands and alkaline fields in the San Joaquin Valley and southward to Southern California. May-Aug.

5. TETRAGONIA L. SEA SPINACH.

Succulent annual with alternate plane leaves. Flowers axillary, greenish, apetalous. Calyx 4-lobed, adnate to the 3 to 9-celled ovary. Stamens 1 to many, perigynous. Fruit a hard or bony nut, indehiscent, enveloped by the calyx which bears several horn-like protuberances. (Greek, tetra, 4, and gonu, knee or angle, alluding to the fruit.)

1. *T. expansa* Murr. NEW ZEALAND SPINACH. Branches procumbent or prostrate; leaves rhombic-ovate, entire, 4 to 5-nerved beneath, 1 to 2½ in. long, abruptly contracted at base to a broad petiole, the surface covered with crystalline papillae; flowers subsessile, 1 to 3 in each axil; calyx-lobes widely spreading, yellowish within; fruit 4-horned, 4 to 6 lines long.

Beaches of San Francisco Bay. Naturalized from China and New Zealand.

6. MESEMBRYANTHEMUM L. FIG MARIGOLD. ICE PLANT.

Ours glabrous perennial herbs. Stems and leaves very succulent, the latter opposite, without stipules. Flowers axillary and terminal. Calyx-tube adnate to the ovary, the lobes unequal and foliaceous. Petals linear, very numerous, inserted with the innumerable stamens on the tube of the calyx. Ovary in ours 10 to 12-celled, the styles as many as the cells of the ovary and distinct or nearly so. Capsule becoming baccate, dehiscing in rainy weather by stellate valves at the flattened summit. Seeds minute, numerous. (Greek mesembria, mid-day, and anthemon, blossom.)

1. *M. aequilaterale* Haworth. SEA FIG. Stems several ft. long, the plants often forming extensive mats; leaves 3-sided, with nearly flat faces, thicker than broad, 1½ to 2 in. long; flowers terminal, subsessile or shortly peduncled, fragrant and showy (1¼ to 2 in. board); petals bright rose-purple; styles 6 to 10.

Dunes and cliffs near the sea from Marin Co. southward to San Diego. In cultivation at Berkeley under the student name of "Faculty Onions." Called "Beach-Apple" in San Luis Obispo Co.

CARYOPHYLLACEAE. PINK FAMILY.

Herbs of inert properties, with commonly swollen nodes, simple and entire leaves always opposite, and regular perfect flowers. Calyx persistent. Corolla white, red or pink. Sepals and petals 5 (or 4), the stamens as many and alternate with the petals, or twice as many, rarely fewer. Ovary superior, 1-celled (imperfectly 3-celled in some *Silenes*), with 2 to 5 styles and 1 to many ovules on a free central placenta. Fruit a few to many-seeded 1-celled capsule dehiscent at the summit by short valves or teeth (these as many or twice as many as the carpels), or 1-seeded and indehiscent, thus becoming a nutlet or utricle. Embryo in all ours curved around the periphery of the seed, the endosperm occupying the center.

A. Fruit a capsule; stipules none.

Sepals united into a 5-toothed tubular or campanulate calyx; petals narrowed below into a conspicuous claw; these with the (10) stamens and ovary frequently raised above the calyx on a stipe; flowers mostly large and showy.

Styles 2; capsule opening by 4 short teeth; calyx with 5 prominent angles; petals not appendaged 1. *VACCARIA*

Styles 3; capsule opening by 3 or 6 teeth or valves; claw of the petals commonly bearing scales or appendages at its junction with the blade 2. *SILENE*.

- Styles 5; capsule coriaceous, opening by 5 teeth; calyx-teeth conspicuously prolonged, exceeding the large petals, these without appendages.....3. *AGROSTEMMA*.
Sepals distinct; petals spreading, without claws or appendages, or in a few species wanting; stamens 3 to 5 or 10; ovary not stipitate; fruit a capsule; low herbs.
 Stipules none.
 Petals retuse or bifid; styles 5, opposite the sepals.....4. *CERASTIUM*.
 Petals parted almost to the base into narrow segments; styles 3 or 4....5. *STELLARIA*.
 Petals entire; styles 3.....6. *ARENARIA*.
 Petals entire or slightly emarginate, or none; styles 5, opposite the sepals.....7. *SAGINA*.
 Stipules present, scarious (setaceous in no. 11).
 Petals entire, mostly conspicuous (for the group).
 Styles 3, distinct; leaves opposite.....8. *SPERGULARIA*.
 Styles 5, distinct; leaves apparently whorled.....9. *SPERGULA*.
 Petals minute or none.
 Styles 3, short, united below; leaves opposite or in 4s, oblong or obovate.....10. *POLYCARPON*.
 Style short or none; leaves opposite, subulate, cuspidate.....11. *LOEFLINGIA*.
B. Fruit a utricle or nutlet; stipules present.
Sepals distinct or slightly united at base; petals none or represented by mere bristle-like organs; very small or prostrate herbs.
 Annual; stipules and flowers minute.....12. *HERNIARIA*.
 Perennial; stipules conspicuous, silvery-scarious.
 Leaves subulate; sepals very unequal, armed with a divergent spine.....13. *PENTACAENA*.
 Leaves oblanceolate; sepals equal, cuspidate.....14. *PARONYCHIA*.

1. *VACCARIA* Medic.

Glabrous glaucous annual with sessile exstipulate leaves and showy red flowers in a broad, loose, flat-topped corymb. Calyx synsepalous, ovate, with 5 prominent angles. Petals 5, clawed, not appendaged. Stamens 10. Styles 2. Ovary 1-celled but with rudimentary partitions at base. Capsule ovate, dehiscent at apex by 4 short teeth. (Latin *vacca*, cow, some species used for fodder.)

1. *V. vulgaris* Host. Cow HERB. Strictly erect, dichotomously branching above, 2 to 3 ft. high; leaves ovate, 3 or 4 in. long with cordate-clasping base; flowers 7 to 9 lines long; petals red, the blade obovate and claw linear.

Grain-field weed naturalized from Europe: Berkeley Hills, *Miss Hanscom* (1895); College City (Colusa Co.).

2. *SILENE* L. CATCH-FLY. CAMPION.

Annual or perennial herbs, more or less viscid and mostly large-flowered. Calyx tubular or inflated, 5-toothed. Petals 5, with long claws; summit of the claw commonly furnished with an entire or cleft scale or appendage, sometimes called a crown; blades spreading, entire or more commonly cleft or lacinate. Stamens 10. Styles 3, rarely 4. Capsule opening by 3 or 6 teeth at apex. (Greek *sialon*, saliva, the stems and other parts viscid.)

Annuals.

Flowers in cymes with unequal branches; pubescent throughout.....1. *S. multinervia*.

Flowers in a compound cyme; middle of some of the upper internodes with a viscid belt.
 2. *S. antirrhina*.

Flowers in a one-sided raceme; stems hirsute.....3. *S. gallica*.

Perennials.

Flowers large, 1 in. broad or more, scarlet; blade of petals deeply cleft, the segments bifid with entire or toothed lobes.....4. *S. californica*.

Flowers smaller, rose-color; blade of petals bifid to the middle, the lobes entire or bearing a very small lateral tooth.....5. *S. verecunda*.

1. *S. multinervia* Wats. Erect, about 1 ft. high; pubescent throughout, viscid-glandular above; leaves linear-oblong; inflorescence cymose with unequal branches; calyx ovate in fruit, about 20-ribbed, the ribs equally promi-

nent; petals small, pink, without appendages, not exceeding the subulate spreading calyx-teeth.

Said to be an introduced plant. Mt. Tamalpais; Southern California.

2. *S. antirrhina* L. SLEEPY CATCHFLY. Erect, slender, sparingly branched, 1 to 1½ ft. high, mainly glabrous; leaves oblong-lanceolate or linear, 1 in. long; inflorescence paniculate; pedicels 1 in. long, more or less, filiform; flowers small; petals pink or red, emarginate, 1 line long; appendages minute; capsule ovoid, 3 lines long.

Throughout California, but nowhere common.

3. *S. gallica* L. WINDMILL PINK. Erect, simple or sparingly branched, 10 to 15 in. high, hirsute or hispidulous with spreading hairs; leaves spatulate-obovate, 1 to 1½ in. long; flowers in a mostly 1-sided raceme on very short (1 to 2 lines long) pedicels; petals white or flesh-color, the blades obovate and entire and appendages small; ovary almost completely 3-celled.

Naturalized from Europe; everywhere in fields and along roadsides, the only common pink. Apr.-May. The petals are commonly twisted one-fourth round or nearly so, thus resembling the fans of a turbine windmill.

4. *S. californica* Durand. INDIAN PINK. Stems half-erect, very leafy, 1 to 2 ft. long, from a stout taproot descending vertically to a depth of 1 or 2 ft.; herbage puberulent and more or less glandular; leaves elliptic-ovate or ovate to oblanceolate, more or less abruptly acuminate, 1 to 3 in. long; pedicels ½ to 1½ in. long; calyx 7 to 10 lines long; corolla scarlet, more than 1 in. broad; petals deeply 4-cleft, the segments toothed or the lateral entire; appendages conspicuous, with 3 or 4 minute teeth; capsule ovoid, concealed until dehiscence by the broad calyx; seeds regularly papillate, the papillae with a depression in the center.

Open woods of cañons, Coast Ranges and Sierra Nevada. June.

5. *S. verecunda* Wats. Finely pubescent below, glandular-viscid above; stems several, erect or decumbent, 1 to 1½ ft. long, leafy especially near the base; leaves mostly linear-lanceolate (or those below broadly oblong), all acute; flowers terminal or borne in 3-flowered lateral cymes, the pedicels short and stout; calyx cylindric, ½ in. long, or becoming clavate or obovate as the fruit develops; petals 9 lines long, rose-color, the blade (3 lines long) cleft to the middle into entire or slightly toothed oblong lobes; appendages oblong or lanceolate, obtuse and often notched at the apex.

Not common: Mt. Diablo; San Francisco Peninsula; Pt. Reyes, and southward to Southern California. May-July.

3. AGROSTEMMA L.

Tall hairy annual, with linear ex-stipulate leaves and few long-peduncled purplish-red flowers. Calyx-tube ovoid, with 10 strong ribs, the 5 teeth conspicuously prolonged into foliaceous lobes exceeding the five large entire unappendaged petals. Stamens 10. Capsule coriaceous, dehiscent by 5 teeth. (Latin ager, a field, and stemma, a wreath, the showy flowers in ancient times made into garlands.)

1. *A. githago* L. CORN COCKLE. Erect, rather strictly branching, 1½ ft. high, hirsute with long ascending or somewhat appressed whitish hairs, especially on the peduncles and calyx; leaves 2 to 4 in. long, 1½ to 2½ lines wide, tapering to the acute apex; flowers solitary, long-peduncled; calyx-teeth ¾ to 1 in. long, rather longer than the tube, or in age much longer and even-

tually deciduous from it; corolla $\frac{7}{8}$ to $1\frac{1}{2}$ in. in diameter; blade of petals obovate, black-dotted toward the claw.

Occasional grain-field weed, naturalized from Europe, first reported from Berkeley in 1891. Since then more widely spread, but not yet common: College City, *Alice King*; St. Helena, *Mrs. D. O. Hunt*, 1908; Sutter Co., *J. A. Wilkinson*, 1908.

4. CERASTIUM L. MOUSE-EAR CHICKWEED.

Pubescent herbs with white flowers. Cymes dichotomous with herbaceous or scarious bracts. Sepals 5, distinct. Petals as many, retuse or bifid. Stamens 10 or 5. Styles 5. Capsule elongated, cylindric, often curved, usually exceeding the calyx, dehiscent at apex by 10 teeth, these erect or spreading. Seeds rough, more or less flattened. (Greek *keras*, a horn, in allusion to the elongated curved capsules.)

Annual; petals about equaling the sepals.....1. *C. viscosum*.
Perennial; petals about twice as long as sepals.....2. *C. arvense*.

1. *C. viscosum* L. MOUSE-EAR CHICKWEED. Erect, 3 to 4 in. high, pilose-hirsute and somewhat glandular, especially on the calyx; leaves ovate to elliptic-oblong, sessile, slightly connate, 7 to 12 lines long; pedicels mostly shorter than the flowers; petals equaling or distinctly shorter than the sepals, oblong, bifid at apex, 2 lines long; stamens 10, one or more with reduced or abortive anthers, or sometimes only 5 with anthers, the other 5 represented by mere scale-like filaments; capsule tubular, the slightly curved apex contracted, much exceeding the calyx, $3\frac{1}{2}$ lines long; seeds numerous, minutely muriculate.

Common in fields and by roadsides. Mar.-Apr. Naturalized from Europe.

2. *C. arvense* L. FIELD CHICKWEED. Pubescent throughout; stems several from a decumbent base, very leafy at base, nearly naked above, 5 to 9 in. long; leaves linear, acute, the upper 1 to $1\frac{1}{2}$ in. long, the lowermost often but half as long; cyme contracted, bearing 1 to 5 flowers; sepals $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, scarious-margined; petals usually twice as long as the calyx, obovate, deeply notched; capsule scarcely exceeding the calyx.

Near the coast: San Francisco Peninsula and Marin Co. Apr.-May. Var. MAXIMUM Hollick & Britton. (*C. pilosum* Brew. & Wats. not Ledeb.) Stout, tall, 1 to 2 ft. high; leaves elongated; inflorescence very spreading; capsule equaling to nearly twice the length of the calyx.—Pt. Reyes.

5. STELLARIA L. CHICKWEED.

Low herbs, loving moist ground or shaded habitat. Flowers white, small, axillary and solitary, or terminal and cymose. Sepals 5. Petals 5, parted almost to the base into narrow segments. Stamens 3 to 10. Styles 3 or 4. Capsule ovoid or oblong, relatively shorter than in *Cerastium*, dehiscent to below the middle into as many or twice as many valves as there are styles. (Latin *stella*, a star, the flowers star-shaped.)

Annual.

Stems weak, procumbent; bracts foliaceous.....1. *S. media*.
Stems filiform, erect; bracts scarious.....2. *S. nutans*.
Perennial; bracts foliaceous.....3. *S. littoralis*.

1. *S. media* Cyrill. COMMON CHICKWEED. Slightly succulent, with weak procumbent stems, rooting at the lower nodes; lower leaves ovate, acute, rather abruptly contracted into slender petioles, the upper narrower, sessile; floral bracts foliaceous; pedicels slender, deflexed in fruit; petals shorter than the pubescent sepals; stamens 3, 5 or 10; styles 3.

Common weed along fence lines and ditches and shaded half-waste places generally. Feb.-May. Stems with a pubescent line, and petioles of lower leaves hairy.

2. *S. nitens* Nutt. Erect, with very slender stems, branching above, 3 to 7 in. high, glabrous or slightly hairy below; leaves linear, acute, sessile, 2 to 7 lines long, or the lowest ovate, 1 to 3 lines long, abruptly contracted into slender petioles nearly twice as long; inflorescence strict, the pedicels erect, $\frac{3}{4}$ in. long or less or some of the flowers quite sessile; bracts scarious; sepals scarious-margined, subulate-lanceolate, 2 lines long; petals $\frac{1}{2}$ as long as the sepals, sometimes none; capsule oblong, nearly as long as the calyx.

Grassy hillsides and plains, a somewhat obscure plant, occurring from Solano Co. southward to Southern California. Apr.-May.

3. *S. littoralis* Torr. Pubescent, ascending, stoutish, the stems 1 to 2 ft. long; leaves ovate, acute, rounded at the sessile base, $\frac{1}{2}$ to $\frac{3}{4}$ or 1 to $1\frac{1}{2}$ in. long; flowers in a terminal compound cyme; sepals lanceolate, acute, 2 lines long, slightly shorter than the petals; capsule included within the calyx.

Bogs or marshes, seacoast only: Pt. Lobos; Pt. Reyes; Dillon's Beach. June.

6. ARENARIA L. SANDWORT.

Low branching annuals or tufted or prostrate perennials with mostly lanceolate or subulate sessile often rigid leaves. Flowers white. Sepals 5. Petals 5, entire. Stamens 10. Styles 3. Capsule globose or short-oblong, dehiscent into as many entire or 2-cleft valves as there are styles. (Latin arena, sand, in which many species grow.)

Low annuals.

Leaves lanceolate, rather broad at the very base, 2 lines long.....1. *A. californica*.
Leaves filiform, 3 to 5 lines long.....2. *A. douglasii*.

Perennials.

Sepals $\frac{1}{2}$ the length of the petals; palustrine.....3. *A. paludicola*.
Sepals exceeding the petals; montane.....4. *A. macrophylla*.

1. *A. californica* Brewer. Glabrous annual, 1 to 4 in. high, diffusely branching from the base, the stems delicate and filiform; leaves very short, slightly fleshy, 1 to 2 lines in length, obtuse; corolla 3 lines in diameter; petals oblong, $1\frac{1}{2}$ times the length of the ovate-oblong sepals; seeds small, finely roughened.

Gravelly hillslopes or disintegrating rock outcroppings in the Coast Ranges from Mt. Hamilton to Napa Co. and northward; Marysville Buttes. Apr.

2. *A. douglasii* Fenzl. Annual, nearly glabrous, sometimes viscid-glandular; stems much branched, 2 to 6 in. high; leaves filiform, 3 to 5 lines long or the lowermost longer; peduncles filiform; flowers numerous, 4 to 5 lines in diameter; sepals oblong-ovate, narrowly thin-margined; petals obovate, conspicuous; capsule sub-globose; valves rounded at the apex; seeds large, smooth, compressed-reniform, acutely margined.

Sterile soil of hillsides: Coast Ranges and Sierra Nevada. Apr.-May.

3. *A. paludicola* Robinson. Glabrous flaccid plant, the stems several, procumbent, rooting at the lower joints, sulcate, shining, leafy throughout; leaves linear-lanceolate, acute, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, somewhat connate, slightly scabrous upon the margins; peduncles solitary in the axils, 1 to 2 in. long, spreading or somewhat deflexed; sepals elliptic, nerveless, herbaceous, $1\frac{1}{2}$ to 2 lines long, about half the length of the obovate petals; capsule oblong, shorter than the calyx.—(*A. palustris* Wats. not of Gay.)

Swamps, Southern California to Washington. Formerly at Fort Point, San Francisco. Rarely collected.

4. *A. macrophylla* Hook. Puberulent perennial, with running rootstocks and ascending or erect stems, 3 to 4 in. high; leaves in 3 to 5 pairs, lanceolate or linear-lanceolate, acute at each end, more or less punctate, 1 to 3 in. long; peduncles slender, terminal or becoming axillary, 1 to 5-flowered; sepals ovate, acute or acuminate, $1\frac{1}{2}$ to 2 lines long, exceeding the petals; capsule ovoid, nearly equaling the calyx.

Shady slopes in the mountains, from Southern California to Grizzly Peak, Mt. Diablo and northward.

7. SAGINA L. PEARL WORT.

Diminutive herbs with subulate or filiform leaves. Flowers minute, terminal, often long-pediceled. Sepals 5 or 4, usually rotate-spreading in fruit. Petals white, entire or slightly emarginate, or often none. Stamens usually 5. Styles as many as the sepals and alternate with them. Capsule dehiscent to the base by entire valves. (Latin sagina, fattening, some species abundant in sheep-grazed country.)

Filiform annuals.

Sepals and petals 5; herbage nearly glabrous.....1. *S. occidentalis*.

Sepals 4; petals commonly none; herbage glandular-pubescent.....2. *S. apetala*.

Succulent perennial; flowers 5-merous.....3. *S. crassicaulis*.

1. *S. occidentalis* Wats. Inconspicuous annual with almost capillary stems, branching at the base, erect, 2 to 5 in. high; slightly hispidulous-glandular on the calyx and upper portion of pedicel, otherwise glabrous; upper leaves broadly subulate, acute, 2 to 3 lines long, the lower filiform-linear, 3 to 6 lines long; pedicels 3 to 6 lines long; sepals and petals 5; sepals $\frac{3}{4}$ line long, the petals nearly as long; calyx rounded at the base; stamens 3 to 10; capsule $1\frac{1}{4}$ lines in length.

Not uncommon, but obscure and mostly in low ground: San Joaquin and Sacramento valleys; Napa Valley and southward to Southern California. Apr.-May.

2. *S. apetala* Ard. Similar to the preceding but usually glandular-pubescent; leaves linear-subulate, acute, $1\frac{1}{2}$ to 3 lines long; calyx 4-parted; petals 4, minute and obovate, or commonly none.

Naturalized from Europe: North Berkeley, *Davy*; Tehama Co., *Jepson*, 1899.

3. *S. crassicaulis* Wats. Smooth perennial, the stems stoutish and succulent, branching, $1\frac{1}{2}$ to 5 in. long, decumbent; leaves linear, thickish, 2 to 9 lines long, the basal forming a rosette, the cauline connate by broad scarious membranes; flowers erect or nodding; petals and sepals subequal, $1\frac{1}{2}$ lines in length; capsule ovate, little exerted from the fruiting calyx.

Beaches along the coast from Monterey to Tomales Bay. June.

8. SPERGULARIA J. & C. Presl. SAND SPURRY.

Low herbs, usually of alkaline plains, borders of salt marshes, or maritime. Leaves linear or subulate-filiform, semi-terete, with scarious stipules. Sepals 5. Petals 5, purplish or white, entire. Stamens commonly 10. Styles 3, rarely 5. Capsule 3-valved. Seeds often wing-margined. Embryo annular. (Derivative of *Spergula*.)

Erect or ascending, more or less succulent perennials with fusiform fleshy roots.....

1. *S. macrotheca*.

Prostrate perennials.

Stems long and somewhat straggling, from a matted or tufted center, flowering from the middle to the ends of the branches.....2. *S. rubra*.
Plants matted; flowers mostly at the ends of the branches.....3. *S. clevelandii*.
Nearly or quite erect annuals.....4. *S. salina*.

1. ***S. macrotheca*** (Hornem.) Heynh. Stems stout, 7 to 12 in. high, erect or ascending from the short, often branched, woody crown of a very thick and fleshy taproot; herbage deep green and viscid-pubescent; leaves narrowly linear, 1 to 1½ in. long; pedicels 3 to 6 lines long; sepals 3 to 4 lines long, scarious-margined; petals as long, pink; capsule about equaling calyx; seeds with or without a wing, even in the same capsule.—(*Tissa macrotheca* Britt.)

Sandy borders of salt marshes, common about San Francisco Bay. Var. **LEUCANTHA** Robinson. Glabrous except a glandular pubescence on the looser inflorescence; flowers commonly white.—Alkaline plains of the Sacramento southward to the Livermore Valley and the San Joaquin. May-June. Var. **SCARIOSA** (Britt.) Robinson. Herbage pale, glandular-pubescent or almost glabrous; internodes short; stipules ovate, acuminate, 4 to 5 lines long; flowers scattered and on pedicels ¾ in. long or less, or in reduced terminal cymes.—Sea-bluffs, San Francisco to Monterey.

2. ***S. rubra*** (L.) J. & C. Presl. var. **perennans** Robinson. Stems 4 to 9 in. long, slender and wiry, many from a densely tufted base, branching little, flowering from about the middle; herbage comparatively glabrous; leaves narrowly linear, 5 lines long or less; stipules ovate, silvery-scarious, 2 lines long, very conspicuous; pedicels slender, 2 to 4 lines long; sepals oblong, acute, 2 lines long; petals reddish, about equaling the sepals; capsule not exerted from the calyx; seeds with a marginal elevation.—(*Tissa rubra* Britt. var. *perennans* Greene.)

Beaten paths and by roadsides: Sacramento Valley; North Coast Ranges; Berkeley. May. Introduced from Europe, spreading slowly, but more common than ten years since.

3. ***S. clevelandii*** (Greene) Robinson. Perennial with prostrate stems forming deep green mats 5 to 13 in. broad; herbage viscid-glandular; leaves filiform, conspicuously fascicled in the axils, ascending, all longer than the internodes; flowers in terminal cymes; corolla 3 to 4 lines broad, white; seeds winged or not winged, even in the same pod.—(*Tissa clevelandii* Greene.)

Sandy soil near the ocean: San Diego northward to San Francisco.

4. ***S. salina*** J. & C. Presl. Branching, erect or sometimes diffuse and prostrate, the stems 3 to 8 in. long; leaves narrowly linear, commonly shorter than the internodes; pedicels leafy-bracted or the upper bractless, not exceeding the capsules; sepals oblong-ovate, obtuse, scarious-margined, 2 lines long; capsule acute, longer than the calyx.—(*Tissa salina* Britt.)

Alkaline plains of the Sacramento and San Joaquin westward to the salt marshes near the coast. May-Aug.

Var. **involutrata** Jepson, n. comb. Heads of closely aggregated flowers subtended by 2 to several foliaceous bracts.—Mt. Eden; Newark (*S. tenuis* var. *involverata* Robinson).

Var. **tenuis** Jepson, n. comb. Dichotomously and copiously branched, the branches slender and internodes long; flowers very numerous, short-pedicel, the uppermost sessile in close groups; stamens 2 to 5; capsule twice as long as the ovate-oblong sepals.—Rarely collected: Alameda; Hollister. Apr. (*Tissa tenuis* Greene.)

9. **SPERGULA** L. SPURREY.

Annual. Leaves narrowly linear or subterete, apparently in whorls, but really opposite, several others of their own size being crowded in the axils; stipules small and scarious. Flowers symmetrical. Sepals 5. Petals 5, white, entire. Stamens 10, occasionally 5. Styles 5, alternate with the sepals. Capsule 5-valved, the entire valves opposite to the sepals. Embryo spirally annular. (Latin spargere, to scatter, in reference to the dispersion of the seeds.)

1. **S. arvensis** L. CORN SPURREY. Diffusely branching from the base, the stems 1 to 2 ft. long; pubescence of short spreading glandular hairs; leaves slightly fleshy, numerous in rather remote whorls; flowers white, 4 lines broad, in a cymose panicle with strongly divergent branches turned abruptly downward after flowering; petals ovate, exceeding the sepals.

Fields and orchards near the coast: Sebastopol (1903); Olema, Jepson, 1910; Berkeley to Monterey Co. Apr. Introduced European weed. Readily eaten by cattle and said to increase the flow of milk. Flowers opening only of afternoon.

10. **POLYCARPON** L.

Low much branched annual with numerous flat leaves, small scarious stipules and very small flowers in cymes. Sepals 5, more or less carinate, scarious-margined. Petals 5, hyaline, shorter than the sepals. Stamens 3 to 5. Styles united below, very short, with 3 branches. Capsule 3-valved. Seeds several. Embryo little curved. (Greek polus, many, and karpus, fruit, in reference to the numerous pods.)

Leaves in 4s or opposite; inflorescence leafless.....1. *P. tetraphyllum*.
Leaves opposite; inflorescence more or less leafy.....2. *P. depressum*.

1. **P. tetraphyllum** L. Nearly glabrous, the stems prostrate, 2 to 5 in. long; leaves in 4s or opposite, oblong or obovate, short-petioled, 2 to 6 lines long; cyme leafless, many-flowered, dense, the flowers nearly 1 line long or a trifle more, short pediceled; sepals green or purplish; capsule nearly equaling the calyx.

Beaten gravelly places: Napa Valley; Vallejo; Berkeley, Tracy, 1903. Naturalized from Europe. July-Aug.

2. **P. depressum** Nutt. Plants prostrate, 1 to 2½ in. broad with slender stems; leaves spatulate, varying to obovate, obtuse or acute, ½ to 2 lines long; flowers ½ as large as in the preceding; sepals little if at all keeled, about ½ line long; petals white, membranous, linear, ½ as long as the sepals.

Pajaro Hills; Southern California.

11. **LOEFLINGIA** L.

Low rigid annuals, dichotomously branched from the base, with subulate leaves and setaceous stipules. Flowers small, sessile in the axils. Sepals acuminate or awn-tipped, the outer with a tooth on each side. Petals 3 to 5, minute or none. Stamens 3 to 5. Style short or none. Capsule 3-valved, several-seeded. (Peter Loeffing, Swedish traveler of the 18th century.)

1. **L. squarrosa** Nutt. Glandular-pubescent, diffusely branched from base, 2 to 5 in. high; leaves subulate, cuspidate, squarrose-spreading, 2 to 3 lines long; capsule shorter than the sepals.

Lower Sacramento; lower San Joaquin at Oakdale.

12. **HERNIARIA** L.

Ours a very small annual, with minute scarious stipules. Flowers minute,

green, in clusters, crowded, sessile. Sepals united at base. Petals and stamens as in Paronychia. Fruit a 1-seeded indehiscent achene, with a thin pericarp, enclosed in the calyx. (Latin hernia, a rupture, which one species was thought to cure.)

1. *H. cinerea* DC. Tiny erect plants, 1 to 2½ in. high, or sometimes matted, branched from base, the branches bearing 2-ranked branchlets; herb-age hispidulous; leaves oblong-ob lanceolate, 1½ to 2½ lines long; flowers in all the axils, even the lowest; calyx ½ line long, very hispid.

San Joaquin region at the edge of the foothills on either side of the valley; naturalized from southern Europe. May-June.

13. PENTACAENA Bartl.

Tufted perennials with subulate pungent leaves and silvery-hyaline stipules. Flowers sessile, clustered in the axils. Sepals 5, almost distinct, very unequal, hooded, the 3 outer larger, and with a stout divergent terminal spine, the 2 inner smaller and with a shorter spine. Petals minute, scale-like. Stamens 3 to 5, inserted at the base of the sepals. Style very short, bifid. Utricle enclosed in the rigid persistent calyx. (Greek pente, five, and akaina, a thorn, the five sepals spine-tipped.)

1. *P. ramosissima* H. & A. SAND MAT. Stems prostrate, forming dense mats 5 to 18 in. broad, pubescent; leaves crowded on the stems, 3 lines long, the stipules ½ or sometimes nearly as long; calyx 1½ to 2 lines long; sepals hairy or woolly below the divergent spinose apex; utricle apiculate.

Along the entire Californian coast; common on the San Francisco sand hills. Apr.-May.

14. PARONYCHIA L. WHITLOW-WORT.

Prostrate tufted perennial, with scarios stipules and clustered flowers. Sepals 5, linear or oblong, concave or cucullate under the apex, the very tip aristate or cuspidate. Petals filament-like, or minute teeth, or none. Stamens 5, alternating with the petals when these are present, inserted on the base of the sepals. Ovary 1-ovuled. Fruit a utricle enclosed in the persistent calyx, at length bursting longitudinally. (Greek paronuchia, a whitlow or felon, the name applied to an herb used as a remedy.)

1. *P. chilensis* DC. Stems long, tough, with short internodes from a tufted crown, prostrate; leaves oblanceolate, acute, cuspidate, 2 to 4 lines long, much crowded on the branches and branchlets, especially towards the ends; stipules hyaline; flowers obviously pediceled, 3 or 4 in the axils.—(*P. franciscana* Eastw.)

Hilltops in western San Francisco; introduced from South America where it is native. Apr.-June.

PORTULACACEAE. PURSLANE FAMILY.

Low herbs with succulent entire leaves and regular perfect flowers. Calyx chorisepalous (synsepalous in Portulaca). Sepals 2 (or in *Lewisia* 4 to 8), fewer than the petals. Petals 3 to 16, often 5. Stamens 3 to 20, sometimes more numerous. Ovary commonly superior; styles 2 to 8, united below or distinct, stigmatic along the inside. Fruit a 1-celled capsule, dehiscent from the apex by 2 or 3 valves, or circumscissile, the top falling away as a lid.

A. Capsule circumscissile.

Sepals 2, united below and partly adherent to the ovary, the free upper portion deciduous; capsule opening at the middle by a lid. 1. PORTULACA.

Sepals 6 to 8, distinct and free from the ovary, persistent; capsule circumscissile near the base, the upper deciduous part splitting from below.....2. LEWISIA.

B. Capsule 2 to 3-valved.

Sepals 2, distinct and free from the ovary, persistent.

Flowers racemose or axillary; style-branches 3; capsule 3-valved.

Petals mostly red, showy; stamens mostly 5 or more.....3. CALANDRINIA.

Petals mostly white or pinkish; stamens 3 to 5.....4. MONTIA.

Flowers in scorpioid spikes; capsule 2-valved; sepals more or less scarious.....5. CALYPTRIDUM.

1. PORTULACA L.

Fleshy prostrate annual with alternate leaves and yellow flowers. Calyx 2-cleft, the tube adnate to the ovary below. Petals 5 (rarely 6), inserted with the stamens on the calyx. Stamens 7 to 20. Style mostly 3 to 8-parted. Capsule globose, opening transversely, the upper part coming off like a lid. Seeds many. (Old Latin name.)

1. *P. oleracea* L. COMMON PURSLANE. Glabrous; leaves cuneate or obovate; flowers sessile, opening only in sunshine; petals yellow, notched or 2-lobed.

Frequent in low lands: Lake Co.; Napa Valley; Berkeley; Sacramento and San Joaquin valleys. June-Oct.

2. LEWISIA Pursh.

Acaulescent fleshy perennials with very thick farinaceous root bearing a rosulate cluster of leaves and short (in ours) 1-flowered scapes. Flowers large and handsome. Sepals (in ours) 6 to 9, herbaceous, persistent. Petals (in ours) 12 to 16, varying from white to red. Stamens (in ours) numerous. Style-branches 3 to 8, filiform, stigmatic their whole length. Capsule circumscissile near the base, the upper deciduous part more or less valvate-cleft from the base. (In honor of Capt. Lewis of the Lewis & Clarke expedition across the continent, who collected the following species.)

1. *L. rediviva* Pursh. BITTER ROOT. Leaves thick, linear; scapes 1 or 2 in. high, jointed above the middle and bearing an involucrel whorl of 5 or 7 scarious subulate bracts; petals pink or bright rose, $\frac{3}{4}$ to 1 in. long, spreading rotately.

Santa Lucia Mts.; Mt. Hamilton; Mt. Diablo; Mt. Tamalpais; Napa Range; Pope Valley; Kelseyville; Sierra Nevada and far northward to Idaho. May.

3. CALANDRINIA H.B.K.

Low fleshy annuals with alternate entire leaves and ephemeral red or rose-colored flowers, rarely varying to white. Sepals 2, persistent. Petals 3 to 7 (commonly 5). Stamens 5 or more, rarely 3, seldom of the same number as the petals. Style-branches 3. Capsule 3-valved from the apex. Seeds numerous, black and often shining. (J. L. Calandrin, Swiss botanist.)

Capsule enveloped by the fruiting calyx; branches mostly ascending or erect.....

Capsule nearly twice as long as the fruiting calyx; branches mostly trailing.....2. *C. breweri*.

1. *C. caulescens* H.B.K. var. *menziesii* Gray. RED MAIDS. Branching from the base and more or less diffuse, or erect and simple, 2 or 3 to 18 in. high; leaves narrowly oblanceolate to linear, acute; calyx glabrous, or somewhat hispidulous on the margin or midrib of the sepals; petals 5, orbicular-obovate, retuse at apex, crimson or rose-red, 3 or 4 lines long; stamens 7 to 14, commonly 10 to 12, rarely fewer than 7; capsule ovate, short-pointed, enveloped by the sepals which are nearly or quite as long.—(*C. menziesii* T. & G.)

Orchards and vineyards, often very abundant in wet years; also in fields and on hilltops. Behaving like an immigrant. Mar.-Apr. Flowers opening of afternoons. Called "Kisses" in Solano Co.

2. *C. breweri* Wats. Stems lax, trailing or sometimes ascending, nearly 1 to quite 2 ft. long; leaves spatulate or oblong-spatulate; flowers sparse; pedicels longer than in no. 1, often deflexed in fruit; capsule narrower and longer (5 lines long), at length nearly twice as long as the calyx.

Mt. Tamalpais; Southern California. June.

4. MONTIA L. INDIAN LETTUCE.

Moderately succulent low herbs, very glabrous and often glaucous. Stems clustered. Leaves alternate, opposite or mainly radical. Flowers white or pinkish, usually opening the second or third day. Sepals 2, persistent. Petals 5, equal or somewhat unequal, distinct or more or less connate at base. Stamens 5 or 3. Style-branches 3. Capsule 3-valved from the apex. Seeds 1 to 3. (Jos. Monti, Italian botanist.)

A. Petals distinct or nearly so, commonly notched or retuse at apex.

1. Leaves radical or opposite; petals equal.

Leaves all radical, except a sessile and often united opposite cauline pair under the inflorescence; petals equal.

Cauline pair of leaves distinct; perennial.....1. *M. sibirica*.

Cauline pair connate-perfoliate into a roundish or angular disk; petals white, little surpassing the calyx; rather coarse annual.....2. *M. perfoliata*.

Cauline pair partially joined on one side, rarely on both; petals pink, about 3 times the length of the calyx; slender annual.....3. *M. gypsophiloides*.

Cauline pair broadly to narrowly lanceolate, distinct or connate on one side; petals white, 1 to 2 lines long; dwarfish annual.....4. *M. spathulata*.

Leaves opposite along the stem, distinct; perennial by bulblets.....5. *M. chamissonis*.

2. Leaves alternate; petals often somewhat unequal.

Stamens 5.

Perennial by stolons or bulblets; stems simple and peduncle-like.....6. *M. parvifolia*.

Annual; stems diffuse and dichotomous.....7. *M. diffusa*.

Stamens 3; annual.....8. *M. linearis*.

B. Petals united at base into a short tube, not notched at apex.

Stems bearing opposite leaves; petals unequal.....9. *M. fontana*.

1. *M. sibirica* (L.) Howell. Erect, 9 to 18 in. high; radical leaves long-petioled, blades ovate, acuminate or barely acute, 1 to 2 in. long; cauline pair ovate or obovate to almost orbicular, distinct, sessile or short-petioled; raceme very lax, the flowers on long (2½ in. or less) pedicels; sepals ovate, obtusish; petals pink, with 5 longitudinal rose-purple lines, emarginate, 3 to 6 lines long, narrowed at base into a distinct claw.—(*Claytonia sibirica* L.)

Swampy places along the coast. Marin Co. to Mendocino Co. and far north to Alaska. Feb.-June.

2. *M. perfoliata* (Donn.) Howell. MINER'S LETTUCE. Usually 4 to 10 (sometimes 16) in. high; radical leaves long-petioled, the earliest narrowly linear, the later ones ovate, rhomboidal or deltoid; cauline pair completely united into a round and entire or angulately 2-lobed disk, ½ to 4 in. broad; flowers in pairs, threes or fascicles, in a short-peduncled or sessile more or less interrupted raceme; petals white, little surpassing the calyx.—(*Claytonia perfoliata* Donn.)

Everywhere common in orchards or vineyards and in the shade of oak and other trees in the foothills and cañons. Also called Indian Lettuce and Squaw Cabbage. Feb.-June. Var. *NUBIGENA* Jepson. Compact plant with glaucescent herbage, and numerous stems; leaves linear or a few spatulate at apex;

racemes dense; flowers white or pinkish, twice as large as in the species.—Marin Co.; Mt. Diablo.

3. *M. gypsophiloides* (F. & M.) Howell. Slender, 2 to 9 in. high, the branches erect or ascending; herbage very pale and glaucous; radical leaves linear or filiform, the flowering stems 2 to several times as long; cauline leaves pair ovate to linear-lanceolate, partially united on one side; raceme slender, elongated; flowers for their size showy and most delicately beautiful; petals pink, cuneate-obovate, retuse, about 3 times as long as the sepals.—(*Claytonia gypsophiloides* F. & M.)

Northward slopes and summits of the Coast Ranges from Mt. Diablo to Mt. Tamalpais; Napa Co.; Healdsburg and northward. Last of Mar. to early May.

4. *M. spathulata* (Dougl.) Howell. Caespitose, 2 to 6 in. high, the herbage glaucous and very fleshy; leaves linear or lanceolate; cauline leaves lanceolate, nearly distinct or somewhat connate upon one (rarely on both) sides, nearly equaling the raceme; sepals much shorter than the petals; petals somewhat quadrangular, retuse or rounded at apex, short-clawed, white or very light pink, with darker pink markings at base of blade; corolla 4 lines broad; anthers vermilion.—(*Claytonia spathulata* Dougl.)

Common on gravelly or rocky hill tops (often in vineyards and other cultivated areas): Oakland Hills and San Francisco northward along the coast to British Columbia, and south to Southern California. Sierra Nevada. Feb.-Mar.

5. *M. chamissonis* (Esch.) Greene. Perennial by means of bulblets produced at the end of slender runners; stems decumbent or ascending, 4 to 6 in. (less commonly 1 ft.) long, rooting at the lower nodes; leaves opposite, narrowly oblong (varying to elliptic or spatulate), obtuse or acute at apex, tapering into a petiole at base, $\frac{1}{2}$ to 1 (or 2) in. long; racemes 2 to 8-flowered, rarely 1-flowered, bractless except 1 or 2 small bracts at base; pedicels recurved after anthesis; sepals 1 line long, the petals pink or white, rounded at apex and entire, or sometimes retuse, 3 times as long; stamens 5; capsule small, 1 to 3-seeded; seeds conspicuously muriculate-roughened under a lens.—(*Claytonia chamissonis* Esch.)

Wet or swampy meadows: North Coast Ranges (Snow Mt. and northward); Sierra Nevada. Said to have been collected long ago at San Rafael by Kellogg and Harford.

6. *M. parvifolia* (Moc.) Greene. Stems at base bearing clusters or tufts of ovate or obovate petioled leaves $1\frac{1}{4}$ in. long or less; above the somewhat caudex-like base the stems are slender with scattered small (2 to 4 lines long) leaves and are, therefore, peduncle-like; sepals roundish, 1 line long; petals scarcely unequal, obovate or oblanceolate, emarginate, rose-color or white, 4 or 5 lines long; capsule mostly 1-seeded.—(*Claytonia parvifolia* Moc.)

North Coast Ranges; Sierra Nevada from Yosemite northward. Thought to be perennial; certainly propagating by bulblets formed in the leaf axils.

7. *M. diffusa* (Nutt.) Greene. Annual, diffusely branched from the base, 2 to 6 in. high; cauline leaves alternate, ovate, sometimes varying to deltoid, roundish, the upper narrower, $\frac{1}{2}$ to 1 in. long, the petiole nearly as long or longer; racemes 2, 3 or 4, opposite the upper leaves or terminal, 1 to $1\frac{1}{2}$ in. long; raceme 5 to 7-flowered; petals emarginate, white or "rose-color," 2 lines long, slightly exceeding the sepals; pedicels deflexed in fruit; seeds 3, black, $\frac{1}{2}$ line long, lineated, the lineations composed of narrow transverse plates.—(*Claytonia diffusa* Nutt.)

Under pines in the seaward North Coast Ranges: Mill Valley; San Rafael, *Henry Edwards*, 1878; Mendocino and northward. Rare.

8. *M. linearis* (Dougl.) Greene. Annual, nearly simple or very much branched, erect, 3 to 6 in. high; leaves alternate, narrowly linear (1 to 2½ in. long and 1 line wide), sessile by a clasping base; racemes commonly secund, about 6 to 8-flowered; pedicels in fruit spreading or recurved, 2 to 5 lines long; sepals broad and rounded or almost truncate, nearly or quite 2 lines long, white-margined; petals white, obviously unequal, narrowly obovate, narrowed at base or clawed, slightly united on one side and not on other side; stamens 3, inserted on the very base of the petals; ovules 3; seed lenticular nearly or quite 1 line broad, smooth and shining, finely reticulated under a lens.—(*Claytonia linearis* Dougl.)

Coast Ranges: Las Trampas, Contra Costa Co., *Hall*; Napa Valley, acc. to Bigelow, 1854. Sierra Nevada.

9. *M. fontana* L. WATER MONTIA. Annual, or sub-perennial by rooting at the nodes; stems slender 2 to 6 in. long, ascending or procumbent; leaves opposite, narrowly oblanceolate or oblong, somewhat connate at base; petals minute, white, unequal, united at base, and exceeding little the calyx; seeds minute, roughened.

Growing along the margin of small surface streams or in muddy places. Marin Co. to Napa Co., northward to British Columbia and far across the continent. Mar.-May.

5. CALYPTRIDIUM Nutt.

Depressed and rather succulent herbs with alternate spatulate leaves and small ephemeral flowers in solitary or clustered scorpioid spikes. Sepals 2, scarious or scarious-margined, orbicular, emarginate at apex and base. Petals in ours 4, obovate; stamens 1, 2 or 3, twice the length of the petals. Style simple; stigmas 2. Capsule membranaceous, globose-ovate, 2-valved, few to many-seeded. (From Greek kaluptra, a calyptra, the petals closing over each other and carried up on the capsule.)

Stamens 1, 2, or 3, shorter than the petals; style very short or almost none.....

Stamens 3, twice as long as the petals; style very long, filiform.....

1. *C. quadripetalum*.

2. *C. umbellatum*.

1. *C. quadripetalum* Wats. About 9. in. high; branches erect from a decumbent base, leafy up to the short dense spikes; leaves oblong-spatulate, 2 in. long or less, including the tapering petiole; sepals round-reniform, white-scarious and rose-tinged with greenish center, 2 to 4 lines broad, exceeding the 4 petals; capsule oblong-oval, 10 to 20-seeded, little or not at all surpassing the fruiting calyx.

Geysers, Sonoma Co.; Lake Co.; Eel River, northern Lake Co.

2. *C. umbellatum* (Torr.) Greene. PUSSY PAWS. Radical leaves spatulate in a dense rosette; peduncles 1 to 7 in. high; sepals wholly scarious or with a mere greenish center, emarginate at apex and base, equal; petals 4, obovate; 2 stamens opposite petals, the third alternate, these and the long styles exerted; capsule globose-obovate, few-seeded.

Humboldt Co.; Sierra Nevada. June-Sept.

CERATOPHYLLACEAE. HORNWORT FAMILY.

Aquatic submerged fragile herbs, with cylindric jointed stems and whorled sessile exstipulate leaves cut into filiform divisions. Flowers minute, axillary, monoecious, without perianth but surrounded by an 8 to 12-cleft persistent

involucre. Staminate flower consisting of numerous stamens crowded on the receptacle; anthers sessile. Pistillate flower consisting of one pistil; ovary superior, 1-celled, with a single ovule. Fruit indehiscent, beaked by the slender persistent style, spinose or tuberculate at base. Embryo with highly developed plumule. No endosperm.

1. CERATOPHYLLUM L.

The only genus. (Greek keras, a horn, and phyllon, a leaf, the leaves cut into slender rigid divisions.)

1. *C. demersum* L. HORNWORT. Stems slender, $\frac{1}{2}$ to 2 ft. long; leaves in whorls of 6 to 8, the segments prickly-dentate, $\frac{1}{4}$ to 1 in. long; style as long as the achene; this 1 to 2 lines long, with a spine or reflexed horn on each side near the base.

Ponds and lakes: Santa Cruz, San Francisco, and northward. Throughout North America and in Europe. Aug. Seldom collected in fruit; achene variable, the margin winged or wingless and the sides sometimes crested or covered with tubercles.

NYMPHAEACEAE. WATER-LILY FAMILY.

Aquatic perennial herbs with horizontal rootstocks or with tubers. Leaves floating or erect, peltate or deeply cordate. Flowers large, solitary, complete, on long peduncles. Sepals 3 to 12. Petals 3 to many. Stamens 6 to numerous. Carpels 3 to many, superior, united into a single pistil with many cells, or distinct.

Petals many; pistil 1, compound.....1. NYMPHAEA.
Petals 3 or 4; pistils several, distinct.....2. BRASENIA.

1. NYMPHAEA L. POND LILY.

Aquatic or subterrestrial plants. Scapes from creeping rootstocks rooting from beneath and bearing on the upper side the scars of former petioles. Leaves in ours cordate with rounded lobes and narrow or closed sinus; petioles long. Sepals 5 to 12, conspicuous, orbicular, concave, mostly petal-like, unless at base or on the outside. Petals 10 to 20, small and thick, bearing more or less resemblance to staminodia. Stamens hypogynous, numerous, densely imbricated around the ovary, at length recurving; anthers linear; filaments very short. Ovary 10 to 25-celled, the stigmas radiating upon its truncate or disk-like summit. Fruit coriaceous-baccate. (Latin name of the water-lily. Fl. June-Aug.)

Sepals 6 to 7; anthers yellow; stigmatic rays 13 to 22.....1. *N. advena*.
Sepals 5 to 12; anthers dark red; stigmatic rays 15 to 24.....2. *N. polysepalum*.

1. *N. advena* Ait. COW LILY. Rootstock horizontal, creeping; leaves 6 to $9\frac{1}{2}$ in. broad, 9 to 13 in. long, floating or raised above the water on stout subterete petioles; calyx $1\frac{3}{4}$ (when fully expanded, 2 to 3) in. in diameter; sepals 6 or 7, the inner narrowed at base, yellow, the three outer smaller and greenish; petals about 15, nearly or quite concealed beneath the many stamens; stamens in 5 or 6 series; anthers yellow; stigmatic rays 13 to 15 or 22, usually not reaching the edge of the disk; neck beneath the disk scarcely constricted.—(*Nuphar advena* Soland.)

Lakes and sloughs: Stockton; far northward and eastward.

2. *N. polysepalum* Greene. INDIAN POND LILY. Leaves as in the preceding, the sinus $\frac{1}{3}$ to $\frac{1}{2}$ the length of the blade; calyx subglobose or somewhat cup-shaped, 3 (or when fully expanded 4 to 5) in. in diameter; sepals

9 to 12, yellow or brownish red; petals 12 to 18, 6 lines long, 4 lines broad, nearly or quite concealed beneath the many stamens; anthers dark red; stigmatic rays 15 to 24; fruit subglobose, $1\frac{1}{2}$ in. in diameter, with short constricted neck and convex disk.—(*Nuphar polysepalum* Engelm.)

Ponds: Santa Cruz and northward, especially in the high mountains; Sierra Nevada.

2. BRASENIA Schreb.

Leaves peltate, oval, floating, long-petioled from fleshy creeping rootstocks. Flowers small, dull purple. Sepals and petals 3 or 4. Stamens 12 to 18 with filiform filaments. Carpels 4 to 18, distinct, becoming indehiscent clavate pods. (Derivation unknown.)

1. *B. schreberi* Gmel. WATER SHIELD. Leaves $1\frac{1}{2}$ to 4 in. long; petals linear, about 6 lines long.—(*B. peltata* Pursh.)

Lakes and slow streams: Stockton; Clear Lake; far northward and eastward. Also in the Old World.

RANUNCULACEAE. BUTTERCUP FAMILY.

Herbs with alternate or radical leaves (excepting *Clematis*, a shrubby climber with opposite leaves). Flowers commonly perfect, solitary or in terminal racemes or panicles, with the parts all free and distinct. Sepals more than 2, usually 5, often petal-like. Petals usually 5 or more, but sometimes minute or altogether wanting. Stamens indefinite, usually numerous. Pistils several, superior, always 1-celled, bearing a single style. Fruit an achene, follicle or berry. Seeds containing abundant endosperm and a minute embryo.—Leaves mostly palmately divided or lobed, in all cases exstipulate, but the petioles often with a broad sheathing base. Flowers regular, except in *Delphinium* and *Aconitum*, and most frequently with a pronounced convex receptacle. *Thalictrum* is dioecious and *Clematis* polygamo-dioecious. *Actaea* has only 1 pistil.

A. Fruit a follicle; ovary several to many ovuled.

Flowers without spurs, regular.

Petals red, roundish, inserted on a fleshy disk.....1. *PAEONIA*.

Petals none; sepals 5, white2. *ISOPYRUM*.

Flowers with spurs, irregular, complete.

Petals 5, all spurred.....3. *AQUILEGIA*.

Petals 4; upper sepal spurred.....4. *DELPHINIUM*.

B. Fruit a berry; ovary with many ovules.

Flowers very small, whitish, in a short raceme.....5. *ACTAEA*.

C. Fruit an achene; ovary usually with one ovule.

Leaves opposite; woody climber; sepals 4; achene with a feathery tail.....6. *CLEMATIS*.

Leaves alternate or radical.

Flowers perfect.

Petals none; leaves all radical except an involucre whorl of 3.....7. *ANEMONE*.

Petals present.

Sepals spurred; achenes on a slender spike-like receptacle; diminutive herbs.....

8. *MYOSURUS*.

Sepals not spurred; achenes crowded on a convex receptacle so as to appear

capitate9. *RANUNCULUS*.

Flowers dioecious, paniced; sepals small, greenish.....10. *THALICTRUM*.

1. PAEONIA L.

Perennial herbs with ternately divided leaves. Flowers large, solitary and terminal. Sepals and petals 5 or 6, the latter and the numerous stamens borne on a fleshy disk adnate to the base of the calyx. Style short or none. Follicles 2 to 5, thick and leathery, several-seeded. (*Paion*, the physician of the gods.)

1. *P. brownii* Dougl. PEONY. Somewhat fleshy plant 8 to 14 in. high; leaves glaucous or pale, ternately or biternately divided, chiefly radical, the lobes obovate to linear-spatulate; peduncles 1 or 2 in. long; petals orbicular, plane, dull brownish-red, thick and leathery, scarcely longer than the roundish concave sepals; follicles mostly 5, broadly oblong, smooth, 1 to 1½ in. long; stem bending over in age and the fruit resting on the ground.

South Coast Ranges; Southern California; northern Sierra Nevada and north to Washington, where the root was used by the Indians "to give their horses long wind" (J. G. Cooper). A rare herb within our limits.

CALTHA BIFLORA DC. Perennial with simple round-cordate radical leaves and 1 to 2-flowered scapes; flowers showy, with 7 to 10 white sepals and no petals; follicles stipitate.—Marshy slopes, subalpine, Sierra Nevada and northward.

2. ISOPYRUM L.

Low glabrous slender perennials with ternately compound leaves and 2 to 3-lobed petiolulate leaflets. Flowers commonly white, solitary, terminal or axillary. Sepals 5, petal-like. Petals none. Stamens 10 to 30. Follicles 5 to 10, oblong or ovate, 2 to several-seeded. (Isopyron, the Greek name of a species of *Fumaria*.)

1. *I. occidentale* H. & A. Plant of delicate habit; stems from a cluster of slender fusiform roots, branching above, 6 to 10 in. high; leaflets obovate or fan-shaped, 5 to 9 lines long, glaucous beneath; flowers white, 6 to 9 lines in diameter; stamens 23 to 27; follicles sessile, 6 lines long; seeds 8 to 9, wrinkled.

A rare herb of shady places in the lower mountains. Sierra Nevada: Forest Hill; Mariposa. Coast Ranges: Vaca Mts.; Gabilan Range (fls. rose-red).

I. STIPITATUM Gray. Tufted plant 1 to 3 in. high; stamens about 10; follicles stipitate.—Mountains of Northern California (Mendocino Co. and northward.)

3. AQUILEGIA L.

Perennial herbs with ternately compound chiefly radical leaves, petiolulate leaflets and showy solitary flowers. Sepals 5, plane, colored like the petals. Petals 5, all alike and produced backward into large hollow spurs projecting below the calyx. Stamens numerous, some inner ones sterile with dilated filaments, appearing like scarious scales. Pistils 5, becoming several-seeded follicles. (Derivation doubtful, said by some to be from the Latin aquila, an eagle, on account of the claw-like spurs.)

Throat of petal spurs about 2 lines in diameter.....1. *A. truncata*.
Throat of petal spurs about 4 lines in diameter.....2. *A. tracyi*.

1. *A. truncata* F. & M. COLUMBINE. Erect, branching, glabrous 2 to 3½ ft. high; leaves biternate, the leaflets roundish in outline, broadly cuneate at base, at summit incised, the segments lobed or crenately toothed; petioles long, those of the radical leaves 1 ft. long; flowers scarlet, tinged with yellow, pendulous in anthesis; spurs, therefore, erect, ¾ in. long, somewhat exceeding in length the widely spreading sepals, and truncate at the orifice, the blade almost none; follicles nearly 1 in. long, conspicuously veined, the long styles persistent.

Moist shaded places in the lower hills, or at middle altitudes in the mountains, almost throughout California. Not known in the inner Coast Range. May-June.

2. *A. tracyi* Jepson, n. nom. Similar to preceding; viscid throughout;

upper leaves reduced to small bracts; flowers larger and stamens longer; sepals reflexed; petal spurs usually spreading more widely and the throat nearly twice the diameter of the throat in no. 1, and more obliquely truncate; styles very long.—(Probably *A. eximia* Planch., not Borbas.)

Rocky places along streams from Howell Mt., Jos. P. Tracy, to Marin and Mendocino cos. Rare. June-Aug.

4. DELPHINIUM L. LARKSPUR.

Herbs, ours perennial, with palmately divided leaves. Flowers in terminal racemes. Sepals 5, irregular, the upper one produced into a spur at the base. Petals 4, in pairs, with small spreading usually oblique blade on a claw of about equal length, the upper developed backward into nectary-bearing spurs and concealed within the spur of the calyx. Pistils in ours 3, seldom more, becoming many-seeded follicles. (Greek delphinion, larkspur, derived from delphin, the flowers of some species resembling the classical figures of the dolphin.)

Flowers blue, white, pink or lavender.

Roots woody-fibrous or fusiform-thickened.

- | | |
|---|-----------------------------|
| Lower leaves 4 to 7 in. in diameter; flowers whitish; sepals externally villous all over | 1. <i>D. californicum</i> . |
| Leaves mostly 1 to 3 in. in diameter; sepals finely pubescent or nearly glabrous, not villous. | |
| Racemes commonly rather short and few-flowered; pedicels spreading; sepals 7 to 10 lines long | 2. <i>D. variegatum</i> . |
| Raceme commonly elongated and many-flowered; pedicels erect; sepals 4 to 7 lines long | 3. <i>D. hesperium</i> . |
| Root a more or less globose tuber; flowers usually small | 4. <i>D. decorum</i> . |
| Flowers red | 5. <i>D. nudicaule</i> . |

1. *D. californicum* T. & G. COAST LARKSPUR. Stout, $2\frac{1}{2}$ to 7 ft. high, sparsely pubescent, many-leaved; leaves very large, 4 to 6 in. broad, 2 to 4 in. long, deeply parted into 3 to 5 segments; segments indurated, sinuses of the primary divisions mostly closed in the lower leaves, open in the upper; racemes dense, $\frac{3}{4}$ to $1\frac{1}{2}$ ft. long; pedicels 4 to 7 lines long, or the lowest somewhat more; bractlets very long and slender; flowers rather densely pilose-pubescent, white or whitish or somewhat purplish inside, never fully expanded; upper petals entire or very slightly emarginate with a woolly tuft at apex on the inside; lower pair bifid, woolly on the outside; spur mostly longer than the sepals; follicles oblong, turgid, hardly, if at all, diverging.

Low hills near the coast: San Francisco north to Pt. Reyes.

2. *D. variegatum* T. & G. SACRAMENTO LARKSPUR. Commonly about $1\frac{1}{4}$ to $1\frac{1}{2}$ ft. high, more or less hispidulous toward the base; leaves dissected into oblong mostly obtusish mucronulate diverging segments; raceme few (about 1 to 10)-flowered, loose, with ascending or spreading pedicels usually 1 in. long or more, the lower pedicels sometimes much elongated; sepals deep but bright blue, 7 to 12 lines long; spur stoutish, the tip often slightly curved; lower petals large, elliptic or roundish, commonly colored like the sepals; upper petals obliquely oblong, whitish; capsule oblong, rather turgid, 7 to 10 lines long, hispid-pubescent; seeds with brownish-winged angles.

Monterey north through the Coast Ranges to Napa Valley and the Sacramento Valley. Var. *APICULATUM* Greene. Flowers on shorter pedicels in a compact cylindrical raceme.—Foothills on west side of the Sacramento Valley.

3. *D. hesperium* Gray. WESTERN LARKSPUR. Stem commonly simple, $1\frac{1}{2}$ to 3 ft. high, arising from a cluster of thick-fibrous roots or a single woody tap-root; herbage short-pubescent; leaves 2 to 3 times palmately cleft into

oblong or linear spreading segments; raceme rather dense, virgate, 6 to 12 in. long; pedicels 4 to 8 lines long, or the lowest 1 in., strictly erect; flowers blue, pink or white and running into various intermediate shades; sepals 4 to 6 lines long, equaled or exceeded by the straight spur; petals little shorter than the sepals, the lateral pair emarginate or shortly cleft; follicles short-oblong, 3 to 5 (or 7) lines long, pubescent; seeds wing-margined.

Dry open ground: Sierra Nevada foothills; lower Coast Ranges, especially towards interior. Flowering at beginning of dry season. Rather common.

D. RECURVATUM Greene. Sepals linear-oblong, conspicuously recurved.—West side of the San Joaquin Valley in low lands.

4. *D. decorum* F. & M. Stem lax, 1 to 1½ ft. high; herbage perfectly glabrous, except a slight pubescence on the branchlets and sometimes on the pedicels; basal leaves thick, often somewhat succulent, roundish in outline, 3 to 5-parted into broadly cuneate segments, 1 to 1¼ in. long; segments entire, or 3-cleft or -lobed; upper leaves pedately 3 to 5 or rarely 7-parted into linear-oblong lobes; racemes mostly many-flowered, 4 in. long or less; pedicels slender, spreading, ½ to 1 or 2 in. long; flowers purple-violet; sepals oval, 5 to 8 lines long, equaled by the spur; petals oblique, 2-cleft, the upper whitish, purple-veined, glabrous, smaller than the lower, these pubescent, especially above; mature follicles thickish, oblong, 5 to 6 lines long, erect or the tips spreading; seeds rough-papillose.

Open woods of the Coast Range foothills from Napa Valley and the Vaca Mts. south to Southern California.

D. MENZIESII DC. Root a cluster of roundish connected tubes; stem often flexuous; flowers few and large; follicles ½ to ¾ in. long, almost always widely spreading.—Washington, Oregon and south to Humboldt Co.

5. *D. nudicaule* T. & G. RED LARKSPUR. Stems slender, 1 to 2 ft. high, few-leaved or quite naked; leaves somewhat succulent, parted into broad mostly obtuse divisions; racemes 2 to 12-flowered, loose and open; pedicels 1 to 3½ in. long; calyx red, ⅞ to 1¼ in. long; petals partly or mostly yellow, the upper narrowly obovate, sharply notched at summit, much larger than the small cleft lower ones; follicles glabrous, divergent at summit.

Banks of rivulets and rocky summits of the Coast Ranges from the Santa Lucia Mts. to Mt. Tamalpais, Napa Valley and northward.

D. CARDINALE Hook. Stem leafy; leaves divided into narrowly linear or lanceolate divisions; flowers usually larger and a deeper red than in *D. nudicaule*.—Southern California towards the coast.

5. ACTAEA L. BANEERRY.

Perennial herbs with bi- or tri-ternately compound ample leaves. Flowers small, white, in a short terminal raceme. Sepals about 4, roundish or obovate, concave, caducous. Petals small, entire, or none. Stamens many, with small anthers and slender white filaments, more showy than the petals. Pistil 1; ovules 10 in 2 rows; stigma broad, sessile, obscurely 2-lobed. Fruit a berry. (Latin name of the Elder, transferred by Linnaeus to these plants.)

1. *A. rubra* (Ait.) Willd. var. *arguta* Lawson. Plants with stoutish rootstocks, propagating vegetatively by suckers; stems clustered, 1½ to 2¼ ft. high; leaves mostly radical, 1 to 2 ft. long, triternately divided, then trifoliate, or the middle divisions again ternate; leaflets rather deeply incised and sharply serrate, 1¼ to 2½ in. long; petioles short or almost none; racemes terminal, 1 in. long, or with 1 or 2 small lateral racemes in the axils of the upper leaves; tips of sepals often pinkish; petals none, or 1 or 2 and white,

rhombic-spatulate, concave dorsally; stamens 11 to 14 or 18; berries red or white, with polished surface.—(*A. spicata* var. *arguta* Torr.)

North slopes of brushy or wooded hills: Oakland Hills, Marin Co. and northward near the coast. (Pistils sometimes 2 and partly united.—Berkeley, 1908.)

6. CLEMATIS L. VIRGIN'S BOWER.

Stems woody below, climbing by aid of the petioles of the opposite compound leaves. Peduncles axillary, bearing 1 to numerous flowers. Flowers polygamodioecious. Sepals 4, valvate in the bud, white and petal-like. Petals none. Stamens numerous. Achenes numerous in a head-like cluster, the styles persistent as hairy or plumose tails, very conspicuous in fruit. (Ancient name, from Greek *klema*, a twig.)

Peduncle bearing a panicle of many flowers; leaflets 5 to 7.....1. *C. ligusticifolia*.
Peduncle 1 to 3-flowered; leaflets 3.....2. *C. lasiantha*.

1. *C. ligusticifolia* Nutt. YERBA DE CHIVATO. Nearly glabrous, except the inflorescence; leaflets 5 to 7, ovate, cordate or obtuse at base, 3-lobed or coarsely toothed about midway, or nearly entire, mostly 1 to 3 in. long; peduncles 1 to 4 in. long, bearing a panicle of many to numerous flowers; flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter.

Valleys, foothills and mountains, climbing high over shrubs: Coast Ranges, Sierra Nevada, Southern California. Sepals sometimes 5 (Napa Valley, 1901). An infusion of the herbage is valued by Spanish-Californians as a remedy for cuts in horses made by barb-wire.

2. *C. lasiantha* Nutt. PIPE-STEM. Branchlets and sepals tomentose-pubescent, the foliage less so; leaves trifoliate, the leaflets elliptic to orbicular, truncate or rounded at base, coarsely toothed and often 3-lobed, 1 to 2 in. long; peduncles 1 (rarely 3)-flowered, 2 to 6 in. long with 2 bractlets usually below the middle; flowers polygamous, $1\frac{1}{4}$ to $2\frac{1}{4}$ in. in diameter; sepals broadly oblong; achenes 2 lines long, supporting a tail 1 in. long or more, the fruit of one flower forming a head-like cluster 2 to $2\frac{1}{2}$ in. broad.

Coast Range and Sierra Nevada cañons, clambering over low shrubs and often illuminating a hillside with its profusion of flowers. Apr.-May.

C. PAUCIFLORA Nutt. Rope Vine. Flowers solitary or few; achenes glabrous (in the preceding species the achenes are pubescent).—Southern California, trailing over rocks or climbing trees.

7. ANEMONE L. WIND-FLOWER.

Perennial herbs, the stems and radical leaves from a rootstock. Cauline leaves none except an involueral whorl of 3 near to or distant from the solitary or umbellate flowers. Sepals 5 to 8, petal-like, imbricate. Petals none. Stamens numerous. Achenes numerous, the style short or developing into a long plumose tail. Seed suspended. (Greek *anemos*, wind, the flowers disturbed by the wind.)

1. *A. quinquefolia* L. var. *grayi* Jepson. WOOD ANEMONE. Stems slender, 1-flowered, 4 to 12 in. high, from a horizontal rootstock; radical leaf simple, of reniform outline, trifid; involueral leaves 3-foliate, petioled; leaflets obovate, entire at base, crenately toothed or incised above, the lateral usually oblique, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; flowers white or pale blue, 6 to 8 lines broad; sepals about 6; achenes with short recurved style.

Shady mountain woods: Santa Cruz Mts.; Mt. Tamalpais; Humboldt Co.

A. DELTOIDEA Hook. Near the last; radical leaf 3-foliate; involueral leaves sessile; achene with straight style.—Humboldt Co. and northward.

A. OCCIDENTALIS Wats. Stems from the crown of a thick vertical root, 1-flowered; leaves much divided; achene with long plumose tails.—High Sierra Nevada.

8. MYOSURUS L.

Dwarf annuals with entire tufted radical leaves and naked 1-flowered scapes. Sepals 5, spurred at base. Petals 5, with a nectar-bearing hollow at the summit of the slender claw. Stamens 5 to 20. Achenes numerous, crowded on a long and slender spike-like receptacle. Ovules attached near the summit of the cell. (Greek mus, a mouse, and oura, a tail, in allusion to the curious receptacles.)

Flowers on scapes; achenes with an appressed beak.....1. *M. minimus*.
Flowers sessile, the spike-like receptacles in a close cluster; achenes with a spreading beak2. *M. alopecuroides*.

1. ***M. minimus* L.** MOUSE TAIL. Leaves linear-filiform; scapes 3 to 6 in. high, the slender receptacles $\frac{1}{2}$ to $1\frac{1}{4}$, commonly about 1 in. long; mature achenes with somewhat rhomboidal back and very low keel ending in a straight appressed or rarely obsolete tip.

Low ground; inner Coast Ranges; Sacramento and San Joaquin valleys; far eastward.

2. ***M. alopecuroides* Greene.** ANTIOCH MOUSE TAIL. Leaves 1 line wide, $2\frac{1}{2}$ in. long or less; spike-like receptacles 6 to 10 lines long, rather thick, sessile, in clusters of about 4 to 9; achenes with prominent spreading beak.

Shallow vernal pools: Antioch, Stockton and north to Vacaville. Mar.-Apr. Too near *M. sessilis* Wats.

9. RANUNCULUS L. BUTTERCUP.

Annual or perennial herbs with divided or entire leaves. Flowers solitary or somewhat corymbd, yellow or white. Sepals 5, rarely 4 or 3. Petals 5 (rarely 1 or 3) to many, with a little nectar-bearing pit at base, the pit commonly covered by a scale. Stamens usually numerous. Achenes numerous, in a globular or oblong cluster. Ovules attached near the base of the cell. (Latin name for a little frog, some species aquatic, growing where frogs are found.)

A. Petals yellow; nectar-bearing pit covered by a scale.

Leaves undivided; achenes not strongly flattened.

Petals 5; beak of achene straight but short; perennial.....1. *R. flammula*.

Petals 1 to 3, minute; achene beakless or nearly so; annual.....2. *R. pusillus*.
Leaves lobed, cleft or divided; achenes flattened.

Perennial; achenes smooth (hispidulous in no. 7).

Leaves with mostly 3 leaflets; petals 5, emarginate; beak subulate, straight.....

3. *R. bloomeri*.

Leaves ternately once or twice divided, the divisions parted, lacinate or lobed.

Petals 5 to 8; beak subulate, as long as body of achene.....4. *R. orthorhyncus*.

Petals 5; beak very broad, only slightly curved.....5. *R. canus*.

Petals many (about 9 to 16), in some of the varieties few (5 to 8); beak very short, recurved; herbage more or less pubescent or hirsute; common.....

6. *R. californicus*.

Petals 5; beak rather slender, curved or hooked.....7. *R. occidentalis*.
Annual.

Achenes with hooked hairs; slender herbs with minute flowers.....8. *R. hebecarpus*.

Achenes bearing prickles on the sides, the margin with raised border; flowers 4 or

5 lines broad.....9. *R. muricatus*.

B. Petals white; nectar-bearing pit not covered by a scale; aquatic.

Leaves submersed, dissected into capillary divisions; achenes many.....10. *R. aquatilis*.

Leaves floating, with broad divisions; submersed leaves as in the preceding or none; achenes 4 to 6.....11. *R. lobbii*.

1. ***R. flammula* L. var. *intermedius* Hook.** SPEARWORT. Perennial;

stems slender or almost filiform, decumbent and creeping, rooting at the joints, 4 to 11 in. long; leaves lanceolate or linear-lanceolate, entire, 1 to 2 in. long, tapering into the petiole; flowers 2 to 5 lines broad; achenes few, thick, less than 1 line long, the beak short.

Margins of lakes or shallow slow meadow-streamlets: Sierra Nevada at middle altitudes; Humboldt Bay; Pt. Reyes. July.

2. *R. pusillus* Poir. var. *lindheimeri* Gray. Slender annual, 4 to 10 in. high, or succulent and only a few in. high; herbage glabrous or the dilated petiole sometimes sparingly villous-ciliate; leaves long-petioled except the uppermost; radical round-ovate, toothed or entire, 3 to 6 lines long; cauline elliptic-oblong to linear-lanceolate, entire or slightly denticulate, 1 to 2 in. long; flowers minute; sepals subscarios, mostly not reflexed; petals commonly 1 to 3, less than 1 line long; achenes numerous in a small globose head, papillose, beakless or nearly so.

Low wet places, rare: Napa Valley; Sonoma; San Rafael. Apr.-May.

3. *R. bloomeri* Wats. Glabrous somewhat succulent herb, the stems 5 to 16 in. high, from a cluster of thick-fibrous or even slender-fusiform roots; a few leaves simple, but mostly trifoliate, the radical long (1 ft. or less)-petioled; leaflets roundish, dentate with coarse round teeth, usually petiolulate, sparsely incised or 3-lobed; flowers few and large, $1\frac{1}{4}$ in. in diameter or less; petals 5, emarginate at apex, the greenish area at base conspicuous and the gland large; achenes turgid, $1\frac{1}{2}$ lines long, tipped with a slender subulate beak.

Low fields near the coast: San Mateo Co.; West Berkeley; Marin Co.; Napa Valley and north to Ukiah and Long Valley (Mendocino Co.). Feb.-Mar.

4. *R. orthorhyncus* Hook. var. *platyphyllus* Gray. Stems very stout, $1\frac{1}{2}$ to $3\frac{1}{2}$ ft. long, from a cluster of slender fusiform roots; leaves ternately divided, the divisions broad, sharply or laciniately cleft; radical leaves 3-foliate with the leaflets 3-parted or -divided, on long petioles; petals 5 to 8, round-ovate to broadly oblong, 6 to 10 lines long; achenes glabrous, the slender beak as long as the body.—(Var. *maximus* Jepson.)

Swampy places: Berkeley; Marin Co.; Humboldt Co.

5. *R. canus* Benth. var. *hesperoxys* Jepson. Herbage fragrant, soft-villous when young or on the under surface of the leaves conspicuously canescent; stems $1\frac{1}{2}$ to 2 ft. high; leaves nearly all in a radical tuft, long-petioled, deeply parted and subdivided into many lanceolate acute segments; petals 5 to 8; achenes large, flat, 3 lines long, including the short triangular-subulate beak which is slightly curved at the tip.

Antioch; Montezuma, Platt, 1902. Mar. *R. canus* is very silky-lanate throughout.—Originally collected by Hartweg in the valley fields of Butte Co.

6. *R. californicus* Benth. COMMON BUTTERCUP. Herbage deep green and nearly glabrous, or with a short stiffish pubescence, especially on the leaves, or soft-pubescent throughout; stems mostly caespitose, erect or decumbent, 9 to 18 in. long, freely branching and many-flowered; leaves roundish in outline, ternately divided, and again divided, parted or lobed, the earlier with the broad divisions obtusely lobed, the later with the laciniately and sharply cleft divisions less broad or narrowly linear, but in these particulars exceedingly variable on the same individual and on different individuals; sepals usually somewhat petal-like, closely reflexed; petals about 9 to 16, obovate to oblong, 4 to 5 lines long; achenes flattened $\frac{3}{4}$ to $1\frac{1}{2}$ lines long, the short and rather stout beak closely recurved.

The most common species, everywhere abundant, coloring leagues upon leagues of grassy hills in the late winter and early spring with its profusion of yellow flowers. Running into numerous varieties, which are scarcely distinguishable in any satisfactory way.

7. *R. occidentalis* Nutt. var. *rattanii* Gray. Very similar to *R. californicus*, but the leaf-segments commonly broad; petals 5; style subulate, forming a curved beak, this longer relatively to the achene which is papillose-roughened and densely hispidulous.

Openly wooded hills of the higher North Coast Ranges and northward.

8. *R. hebecarpus* H. & A. Very slender herb, 5 to 11 in. high, branched above, sparsely villous; leaves thin, rounded or reniform in outline, 3-parted into ovate entire or notched or lobed divisions, or the upper divided into 3 divergent narrowly oblong acute segments; peduncles 3 to 6 lines long; flowers minute, yellow; petals of about the same length as the stamens; achenes few, hispidulous with hooked hairs, orbicular, flat, 1 line long, tipped with a short curved beak.

Common in foothill country in the shade of oak and other trees: Coast Ranges; Sierra Nevada.

9. *R. muricatus* L. Rather stout and succulent, 3 to 10 in. high; herbage yellowish green, glabrous; leaves roundish or reniform, deeply 3-cleft, the segments again cleft or toothed; petals 3 to 4 lines long; achenes 4 lines long, including the stout ensiform beak, the sides very flat, surrounded by a raised border and coarsely muricate or prickly.

Not naturalized from Europe but not common: San Francisco; Marin Co.; Cazadero; Humboldt Bay; Knight's Ferry.

10. *R. aquatilis* L. WATER BUTTERCUP. Perennial; leaves submersed, all many times dissected into filiform or capillary divisions; flowers $\frac{1}{4}$ in. broad or less; sepals deciduous; styles subulate, rarely persisting; achenes transversely rugose, commonly hispidulous, about 11 to 18 in a rather compact round head.

Ponds and slow streams in the valleys and mountains: Coast Ranges; Sierra Nevada. Rather common. Sometimes floating leaves are found with oval or orbicular segments. Apr.

11. *R. lobbii* Gray. LOBB'S BUTTERCUP. Annual; submersed leaves none, or when present, few and as in the preceding; floating leaves 6 lines broad, divergently 3-parted into oblong or ovate lobes, the middle one commonly entire, the lateral notched; stamens 5 to 10; petals withering persistent; style filiform, about 3 times the length of the ovary; achenes few (4 to 6), rather sharply rugose, the mature ones sometimes with minute black dots.

Whitening the surface of shallow vernal pools: Marin Co. to Napa Valley. Apr.-May.

10. THALICTRUM L. MEADOW RUE.

Perennial herbs with tall erect stems from a short rootstock bearing bi- or tri-ternately compound leaves with petiolulate (or some sessile) leaflets. Flowers many, small, panicle, in ours dioecious. Sepals in pistillate flowers 4 to 7, in staminate flowers more commonly 4, greenish or more or less petal-like. Petals none. Stamens numerous with long mucronate anthers on capillary filaments. Achenes 4 to 15, veined or furrowed and usually acute at both ends, sometimes inflated, tipped with the persistent long styles. (Greek thallo, bloom, the application uncertain.)

1. *T. polycarpum* Wats. Glabrous, aromatic, $1\frac{3}{4}$ to 3 ft. high; leaflets ovate to roundish, $\frac{1}{2}$ to 1 in. long, rather prominently veined beneath, serrate or incised or divided into 2 or 3 segments, the teeth acute or acutish; panicle 3 to 6 in. long, terminal or with accessory branches from the upper axils; sepals elliptic to ovate, mostly acute; stamens 16 to 25, anthers yellowish; pistils of about the same number, styles purplish; achenes somewhat inflated, the sides marked with anastomosing veins.

Coast Ranges, but apparently not in inner Coast Range. Apr.-May.

CALYCANTHACEAE. SWEET-SHRUB FAMILY

Aromatic shrubs with opposite entire leaves and no stipules. Flowers large, solitary, terminating the branches. Bracts, sepals and petals passing into each other, imbricated in many series, adnate at base to the enlarged hollow receptacle which is like a rose-cup. Stamens numerous, the inner ones sterile. Pistils many, distinct, nearly enclosed in the hollow receptacle, becoming achenes.

1. CALYCANTHUS L.

Flowers livid red. Petals in several rows at mouth of tube, the inner ones shorter. Styles equaling the anthers, filiform, colorless. Seed without endosperm; cotyledons foliaceous, convolute, caulicle inferior. (Greek kalyx, covering or calyx, and anthos, flower.)

1. *C. occidentalis* H. & A. SWEET SHRUB. Erect branching shrub 5 to 9 ft. high; leaves ovate to oblong-lanceolate, acute, rounded at base, $1\frac{1}{2}$ to 6 in. long; sepals and petals linear-spatulate, $1\frac{1}{4}$ in. long or less, the upper $\frac{1}{2}$ or $\frac{1}{3}$ fading tawny or brown in age; filaments $\frac{1}{3}$ line long; fruiting receptacle cup-like, 1 to $1\frac{1}{4}$ in. long; achenes oblong-ovate, slightly oblique or curved, a trifle flattened and bordered all around with a granular margin, somewhat velvety-hirsute, 4 to 5 lines long.

Along cañon streams in the North Coast Ranges and Sierra Nevada. Called "Spice-wood" on Howell Mt., "Wine Flower" in Sonoma Co., "Spice Bush" in Napa Valley, "Wild Poppy" in Trinity Co., where it is reputed poisonous to cattle, and "Vinegar Bush" in the Kaweah region. A crushed flower is sometimes put in a knotted corner of the handkerchief by mountain people as a perfume.

BERBERIDACEAE. BARBERRY FAMILY.

Shrubs or herbs, ours with alternate compound leaves. Flowers perfect, regular, hypogynous. Sepals 6, in 2 circles. Petals 6, in 2 circles, the stamens as many and opposite them. Anthers opening by an uplifting valve or lid. Ovary one, superior, 1-celled, becoming in fruit a capsule, a berry, or dry and coriaceous. Seeds with endosperm. Achlys is anomalous; it has no perianth and 9 to 13 stamens.

Shrubs or low woody plants; leaves pinnate, prickly; petals bifid.....1. BERBERIS. Perennial acaulescent herbs.

Perianth none; leaves 3-foliate.....2. ACHLYS.

Perianth present; petals entire; leaves triternate.....3. VANCOUVERIA.

1. BERBERIS L. BARBERRY.

Shrubs or low suffrutescent plants with yellow wood. Leaves alternate, prickly, in ours pinnately compound with the rachis jointed at the insertion of the leaflets. Flowers yellow, in racemes. Sepals petal-like. Petals concave, in ours distinctly bifid. Filaments irritable. Stigma peltate-umbilicate. Fruit a berry. (Arabic name.)

Racemes from small lateral or terminal buds, their scales triangular or roundish, deciduous, about 2 lines long.

Leaflets 5 to 7, very undulate and strongly spinose, few-toothed.....1. *B. dictyota*.

Leaflets 5 to 17, nearly plane, with many prickly teeth.....2. *B. pinnata*.
Racemes from a large terminal bud, its scales persistent, glumaceous, about 1 in. long3. *B. nervosa*.

1. *B. dictyota* Jepson. Erect, stout, scarcely branched, 3 to 4½ ft. high, sparsely leafy; leaflets 5 to 7, glaucescent on the upper surface, little paler but very prominently reticulated on the under surface, very strongly undulate, lowest pair close to base of petiole; filaments with a recurved tooth on each side near the apex.

Rocky slopes: western Solano Co.; Marysville Buttes. Rare.

2. *B. pinnata* Lag. CALIFORNIA BARBERRY. A few in. to 4 or 5 ft. high; leaflets usually 5 to 9 but often 11 to 13 (or even as many as 17 and rather crowded on the rachis), ovate-elliptical to oblong, 1 to 2¼ in. long, shining above, somewhat paler beneath, plane or moderately undulate, shallowly repand and dentate, the mostly numerous teeth prickly; lowest pair close to base of petiole; racemes clustered, dense; filaments as in the last.

Rather common on hills, mostly along the edge of thickets. Berkeley Hills, San Francisco and southward to Monterey. Mar.-Apr.

3. *B. nervosa* Pursh. MAHONIA. Leaves in a tuft from a low scaly caudex, 9 to 16 in. long, the rachis conspicuously nodose; leaflets 11 to 17, bright green, ovate to ovate-lanceolate, spinulose-serrate, and somewhat palmately nerved; scales of the strong terminal bud about 1 in. long, coriaceous-glumaceous; racemes erect, elongated, 4 to 6 in. long; bracts oblong to lanceolate, membranaceous; filaments not toothed.

Woods near the coast from Marin Co. northward to Oregon and Washington.

2. ACHLYS DC.

Perennial herbs with long-petioled 3-foliolate leaves and leafless scapes rising from a very slender rootstock. Flowers perfect, in a short dense spike. Calyx and corolla none. Stamens 9 to 13, 2 to 3 times as long as ovary, the outer dilated upward. Fruit dry, indehiscent, broadly moon-shaped. (Greek Achlus, the god of night or gloom.)

1. *A. triphylla* DC. DEER-FOOT. Plants about 1 ft. high; leaflets 2 to 6 in. broad.

Woods near the coast, Mendocino Co. and northward; ranging altitudinally from near sea-level to 7,000 ft. Settlers on the Humboldt coast, prizing the delicate fragrance, hang bunches of the leaves in their houses. To be expected on the northern Sonoma coast.

3. VANCOUVERIA Morr. & Decsne.

Low perennial herbs with slender creeping rootstocks. Leaves tritermately compound, all basal or nearly so. Flowers small, nodding, arranged in an open panicle on a slender scape-like peduncle. Sepals 6, in 2 series, obovate, petal-like, reflexed, subtended by 6 to 9 small calyx-like membranous bractlets. Petals 6, ligulate, tipped with a hood-like nectar-bearing appendage, reflexed. Stamens 6, closely erect about the pistil, the anther connective produced into a pointed tip. Style 1; stigma thin, cup-shaped. Fruit a follicle, dehiscent by the dorsal suture. Seeds with an aril. (Capt. George Vancouver of the English exploring ship *Discovery*, who visited San Francisco Bay in 1792.)

1. *V. parviflora* Greene. INSIDE-OUT FLOWER. Stems 8 to 20 in. high, sparsely hairy, at base rusty-pilose, the panicle pubescent with short spread-

ing gland-tipped hairs; leaves glabrous or with rusty hairs on the petioles at the forks, persisting through the winter; leaflets petiolulate, thickish, roundish in outline, broadly cordate at base, with mostly closed sinus, obscurely or evidently 3-lobed with a notch at the summit of each lobe, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, frequently broader than long, the margin cartilaginous and often crisped; panicle $2\frac{1}{2}$ to 7 in. long, bearing 25 to 55 white or lavender-tinged flowers; sepals 2 lines long; stamens glabrous.

Shade of coniferous forests, especially in the Redwood region: Santa Cruz Mts.; Oakland Hills; Marin Co.; Napa Valley; Humboldt Co. (Hupa Valley, 900 ft. alt. to Trinity Summit, 7,000 ft. alt.).

V. HEXANDRA Morr. & Deesne. Leaflets thinnish, not cartilaginous margined, perishing after maturing of the fruit; panicle glabrous; stamens covered with short gland-tipped hairs.—Woods, commonly in deeper shades than preceding; Santa Lucia Mts. (Zoe, iv, 153); Humboldt Co., 3,000 to 7,000 ft., and northward.

LAURACEAE. LAUREL FAMILY.

Aromatic evergreen trees and shrubs with alternate simple leaves and no stipules. Flowers perfect, regular. Petals none. Anthers opening by uplifted valves. Ovary superior, 1-celled, 1-ovuled, with a single style. Fruit in ours a drupe.

1. UMBELLULARIA Nutt.

Flowers in simple peduncled umbels. Sepals 6. Stamens 9, the three inner with a stipitate orange-colored gland on each side of the filament at base and alternating with scale-like staminodia; anthers 4-celled, 4-valved, the three inner extrorse, the outer introrse. (Latin umbellularia, a little umbel.)

1. **U. californica** Nutt. CALIFORNIA LAUREL. Tree 20 to 60 ft. high with a dense crown of erect slender branches, or in the chaparral as a mere shrub; leaves oblong or oblong-lanceolate, entire, $3\frac{1}{2}$ to $4\frac{1}{2}$ in. long, on short petioles; peduncles in the terminal axils, 4 to 7 lines long; sepals $1\frac{1}{2}$ lines long; drupe subglobose or ovoid, 1 in. long, greenish or when ripe, brown-purple.

Mountain cañons of the Coast Ranges and Sierra Nevada, south to San Diego and north to southern Oregon. Most abundant and of greatest size on the alluvial river flats of northwestern California and adjacent Oregon. The wood prized by the cabinetmaker. Also called Bay-Tree and Bay-Laurel. In the woods of Mendocino and Humboldt known as "Pepperwood," and in Oregon as "Myrtle."

PAPAVERACEAE. POPPY FAMILY.

Herbs (Dendromecon a shrub) with mostly colored juice and regular complete flowers. Sepals 2 or 3, the petals twice as many. Calyx in Eschscholtzia resembling a fool's cap, the 2 sepals completely united into a single piece. Stamens numerous, rarely few. Pistil 1, composed of 2 to several united carpels; ovary superior, 1-celled (several-celled in Romneya); in Platystemon the lightly united carpels become distinct in fruit.

Sepals 3, petals 6; annuals; leaves opposite or radical.

Filaments petal-like; carpels 6 to 20, in anthesis united into a compound ovary, in fruit separating and through constrictions breaking up into 1-seeded joints.....

1. PLATYSTEMON.

Filaments filiform or flattened; carpels 3, united into a 3-angled or terete ovary, forming in fruit a 3-valved capsule.....2. PLATYSTIGMA.

Sepals 2 (in Eschscholtzia the calyx is a single mitre-like piece); petals 4; leaves alternate or basal.

Leaves entire, coriaceous; capsule 2-valved; shrub.....3. DENDROMECON.

Leaves not entire.

Receptacle hollowed or cup-like; flowers erect in bud; capsule 2-valved; leaves ternately dissected; annual or perennial herbs.....4. *ESCHSCHOLTZIA*.

Receptacle not excavated; leaves pinnately cleft, lobed or divided; annuals.

Flowers erect in bud; capsule 4 to 6-valved at summit; prickly herbs.....5. *ARGEMONE*.

Flowers nodding in bud; capsule opening by holes just below summit; unarmed herbs6. *PAPAVER*.

1. *PLATYSTEMON* Benth.

Low annual with mainly opposite entire leaves. Sepals 3. Petals 6, in two series, tardily deciduous, withering and closing about the forming fruit. Stamens numerous; filaments petal-like and obovate or spatulate. Carpels 6 to 17 or 20, each several-ovuled, connivent or coherent in a circle, becoming torulose, at maturity separating, and breaking transversely into indehiscent 1-seeded joints; stigmas subulate-filiform. Anthesis lasting for more than one day. (Greek *platus*, broad, and *stemon*, a stamen.)

1. *P. californicus* Benth. CREAM-CUPS. Conspicuously pilose; branched from the base, widely spreading and more or less decumbent or nearly acaulescent, 3 to 6 in. high; peduncles more or less scape-like, 5 in. long; petals cream-yellow; stamens about 25.

Foothills, plains and valleys; common almost throughout California. Apr. Petals sometimes deeper colored at apex with the deeper color repeated as a spot at base.

2. *PLATYSTIGMA* Benth.

Annual herbs with the leaves, sepals and petals as in *Platystemon*, the flowers rarely with 2 sepals and 4 petals. Petals deciduous. Stamens 6 to 12. Carpels 3, combined into a single 1-celled ovary, which is 3-lobed or nearly terete. Placentae as many as the carpels, parietal, many-ovuled. Stigmas ovate to subulate. Capsule completely 3-valved, dehiscent through the placentae. (Greek *platus*, broad, and *stigma*, a stigma.)

Not acaulescent; peduncles glabrous; petals white; ovary and capsule linear, twisted....

1. *P. californicum*.
Acaulescent or nearly so; scapes hairy; petals light yellow; ovary and capsule narrowly obovoid, 3-lobed.....2. *P. lineare*.

1. *P. californicum* (Torr. & Frem.) B. & H. Very slender, erect, 4 to 7 in. high, paniculately or dichotomously branched above or even from the base; glabrous throughout; radical and lower leaves elliptic to obovate-spatulate, 5 to 11 lines long, often contracted into a petiole, the upper cauline oblanceolate to linear; peduncles 2 to 3 in. long, erect in anthesis, in fruit deflexed almost horizontally but the capsule vertical or nearly so; sepals often reddish; petals white, elliptic to oblong, often narrowed to a short claw, 3 to 5 lines long; stamens 6 to 12, rarely 4, unequal, in two series, the outer shorter; filaments filiform, slightly dilated upwards; capsule $\frac{1}{2}$ to 1 (rarely $1\frac{1}{2}$) in. long.

Sonoma Co. to San Francisco and southward to Southern California. Mar.-Apr.

2. *P. lineare* Benth. Acaulescent or nearly so; scapes commonly 4 to 8 in. high, hispid with spreading hairs; leaves linear, 1 to 2 in. long, sessile; sepals brownish; petals light yellow, cuneate-orbicular or obovate, 4 to 9 lines long; stamens numerous, filaments conspicuously dilated; body of capsule 5 to 7 lines long.

Sandy soil, near the coast: San Francisco southward to Monterey Co. and northward to Oregon. Mar.-May. Outer 3 petals often egg-yellow or with a similar central splotch.

ROMNEYA COULTERI Harv. Matilija Poppy. Tall glabrous perennial with alternate pinnatifid leaves and very large white flowers and frilled petals; capsule 7 to 11-celled.—Santa Maria River to San Diego Co. Also in cult.

3. DENDROMECON Benth.

Glabrous shrub with alternate entire coriaceous leaves and golden yellow flowers. Sepals 2. Petals 4. Stamens numerous, with short filiform filaments and linear anthers. Ovary and capsule linear with 2 nerve-like placentae. Style short, bearing 2 oblong stigmas. Seeds pitted, provided with a caruncle. (Greek dendron, tree, and mecon, poppy.)

1. *D. rigida* Benth. BUSH POPPY. Two to 4 (or 7) ft. high, the main stem bark shreddy; branches whitish; leaves yellowish green, oblong- to linear-lanceolate, reticulate, hispidulous on the margin, mucronate, 1 to 2 in. long, borne on very short petioles which, by a twist, bring the blade vertical; flowers 1 to 2½ in. in diameter, on peduncles 1 to 3 in. long; sepals orbicular; capsule curved, 2 to 4 in. long.

Dry slopes and ridges of the Coast Ranges at middle altitudes from Lake Co. to Mt. Tamalpais and Mt. Diablo; thence southward to San Diego; also in the Sierra Nevada. Last of Apr.-June.

4. ESCHSCHOLTZIA Cham.

Annuals or perennials with watery juice, petioled ternately dissected leaves and peduncled yellow flowers. Receptacle hollowed or excavated, surrounding the base of the pistil, the calyx or corolla in consequence seeming as if perigynous; this receptacle in addition often bears a spreading outer and an erect inner rim. Sepals completely united into a calyptra or pointed cap-like body which parts from the receptacle and is pushed off by the expanding petals. Stamens numerous, mostly on the base of the petals; anthers commonly longer than the filaments. Ovary linear; style very short; stigmas commonly 4, subulate-filiform, unequal. Capsule 1-celled, many-seeded, 2-valved; dehiscence commonly occurs after the capsule parts from the receptacle and before it reaches the ground, usually beginning at the moment that the base of the capsule is released from the vise-like hollowed receptacle, this action allowing the valves which are elastically dehiscent from base to apex, to separate. (Collected at San Francisco in 1816 by Adelbert von Chamisso, German poet and naturalist, and named by him in honor of his college friend and companion on a scientific voyage around the world, Dr. J. F. Eschscholtz.)

Receptacle with broad rim; cotyledons 2-cleft; perennial (or some varieties annual).....

1. *E. californica*.

Receptacle destitute of rim or the rim represented by a mere herbaceous ring; cotyledons entire; annuals.

Stems leafy; petals fan-shaped, longer than broad.....2. *E. caespitosa*.
Acaulescent; petals rhomboidal, mostly broader than long.....3. *E. rhombipetala*.

1. *E. californica* Cham. CALIFORNIA POPPY. Erect or diffuse, 1 to 2 ft. high; radical leaves ternately several times dissected into linear or oblong segments, on long petioles, the whole leaf ⅓ to 1 ft. long; cauline smaller on shorter petioles; peduncles 2 or 3 to 6 in. long; petals fan-shaped, ½ to 2 in. long, varying from deep orange to straw-color; outer spreading rim of the receptacle ½ to 2 lines wide; inner erect rim hyaline; capsule 1 to 3 or even 4 in. long.

One of the most common, striking and widely diffused plants of the California flora, abundant in the spring but in many portions of the State found in flower in other or in all seasons. On account of its gorgeous beauty it has

been favored with an exceptional number of poetic names, mostly derived from Spanish sources, such as "Copa de Oro," "Torosa," "Amapola," "Dormidera."

This species is highly variable, especially so in trivial details of leaf segmentation and of shape of calyptra, and in habit, and so runs into a vast concourse of forms, many of which seem obviously seasonal or are due to slight soil variations or moisture conditions. A large number of these forms have been collected but perhaps not one-tenth (or even less) of those in existence. Yet the number of specimens distributed to herbaria has been sufficient to form the basis for nearly 100 proposed new species, published by Eastern and European systematists within a very few years. It does not seem hopeful that the solving of the problem of *Eschscholtzia californica* in just this way will lead either to permanent results or afford a satisfactory basis for the kind of work most needed, namely the prosecution of combined field and cultural studies.

2. *E. caespitosa* Benth. Annual, $\frac{3}{4}$ to 2 ft. high; stems few or many, slender or rather stout, leafy at base; leaves mostly twice ternately dissected; peduncles 3 to 8 in. long, much exceeding the leaves; calyx oblong-conical, abruptly slender pointed; receptacle short-tubular, 1 to 2 lines deep; petals $\frac{3}{4}$ to 1 in. long; capsule $1\frac{1}{2}$ to 3 in. long; seeds reticulate; embryo $\frac{1}{2}$ of a line long, the cotyledons (as seen in the seed) divergent.

Cañon sides of the higher Coast Ranges: Vaca Mts.; Napa Range and southward. Apr.-May.

E. tenuifolia Hook. Scapose, the leaves in a basal tuft with narrow and comparatively few divisions; petals light yellow, 4 or 5 lines long; seeds strongly muricate with flattened processes.—Sierra Nevada foothills.

3. *E. rhombipetala* Greene. Acaulescent, densely tufted; scapes very many, stout, diffuse, 3 to 4 in. high, twice as long or equaled or exceeded by the thick tuft of nearly equal subradical leaves; these laciniately cleft into 3 to 6 linear divisions, glaucous or glaucescent; receptacle subcylindrical; spreading rim obsolete, likewise the scarious inner margin or this very narrow and approximate to the trace of the obsolete rim; petals rhombic-ovate or orbicular, 5 lines long, 6 lines broad, fugacious; capsule 3 in. long or less, very large for the size of the plant; seeds reticulate; embryo about $\frac{1}{2}$ line long; cotyledons very short, the embryo with scarcely more than a notch at the apex.

Plains and rolling country near the inner Coast Range foothills: Western Solano Co. to Antioch. Mar.-Apr. Scapes sparsely tuberculate-scabrous.

5. ARGEMONE L. PRICKLY POPPY.

Annual herbs with acrid orange juice, prickly sinuate or pinnatifid leaves and flowers erect in the bud. Sepals 2 (often 3), with horn-like appendage below apex. Petals twice as many as the sepals. Ovary 1-celled; stigmas radiate. Capsule 4 to 6-valved at summit. (Greek name of some herb, transferred here.)

1. *A. platyceras* Link & Otto var. *hispida* Prain. CHICALOTE. Leafy-stemmed, branching, 1 to 2 ft. high; petals white; capsule very prickly.

Sand-banks of river bottoms or mountain flats: Northern Lake Co. (Erythraea, i, 14); Sierra Nevada; Southern California.

6. PAPAVER L. POPPY.

Ours annual herbs with narcotic juice. Leaves pinnately cleft, lobed, or divided. Flowers showy, solitary on long peduncles, nodding in bud. Sepals

2. Petals 4. Stamens very many. Ovary and capsule obovoid to subglobose, with 4 to many intruded placentae. Capsule dehiscent just below the stigmatic summit by pores or valve-like openings. (Latin name of the poppy.)

Juice milky; stigmas sessile and radiate upon the summit of the ovary. .1. *P. californicum*. Juice yellow; stigmas capitate upon the short slender style.2. *P. heterophyllum*.

1. **P. californicum** Gray. WESTERN POPPY. Two ft high or less; glabrous or sparsely pilose-pubescent; juice milky; leaves pinnately divided, the segments oblong or roundish, toothed or lobed or entire; petals red with a green spot at base, 7 to 9 lines long; stigmas sessile and radiate upon the summit of the ovary, persistent in fruit; capsule $\frac{1}{2}$ in. long or more, turbinate-obovate, 6 to 11-nerved; pores or valve-like openings just beneath the stigmas, quadrate.

Mt. Tamalpais; otherwise of the southern part of the State from the Santa Inez Mts. to Los Angeles. May. Most frequent where brush has been cleared, either by fire or the axe.

2. **P. heterophyllum** (Benth.) Greene. WIND POPPY. One and one-fourth to 2 ft. high, glabrous; juice yellow; leaves pinnate or pinnately cleft, or pinnate with pinnately cleft lobes, the segments exceedingly diverse in shape on the same plant or even on the same leaf, varying from oval and entire or lobed to narrowly linear; petals broadly cuneate-obovate, brick-red, with a dark spot at base, 1 in. long or less; stigmas capitate at summit of a distinct and slender style; capsule clavate-obovoid, 3 to 7 lines long; pores small with rounded valves which separate from the stout parietal ribs.—(*Meeonopsis heterophylla* Benth.)

Middle California: Berkeley; Livermore; Stockton; San Mateo; southward to Southern California. May. Var. *CRASSIFOLIUM* Jepson. Blood Drops. Plant smaller, more branching and with more numerous flowers; leaves mainly radical, smaller and thicker; flowers small, erect; style commonly longer than in type.—Interior fields.

FUMARIACEAE. FUMITORY FAMILY.

Glabrous herbs with alternate compound dissected leaves and irregular perfect flowers borne in racemes. Sepals 2, small and scale-like. Petals 4, in 2 dissimilar pairs, the outer larger, inner pair narrower, carinate or crested on the back, cohering by the callous apex and covering the anthers and stigma. Stamens in 2 sets of 3 each, placed opposite the outer petals, the filaments of each set usually united; middle anther of each set 2-celled, the lateral ones 1-celled. Ovary superior. Capsule 1-celled, with 2 parietal rib-like placentae from which the valves separate, or indehiscent.

1. **DICENTRA** Bernh. DUTCHMAN'S BREECHES.

Perennial herbs with the stems and leaves from a tuber-like, grain-bearing or scaly crown. Flowers racemose or paniculate. Corolla flattened and cordate at base. Filaments of each set dilated and united, but distinct at the very base and slightly free above. (Greek *dis*, twice, and *kentron*, a spur, some species 2-spurred.)

Stems leafy; flowers yellow; petals distinct.1. *D. chrysantha*. Acaulescent; scape naked; flowers rose-purple; petals united.2. *D. formosa*.

1. **D. chrysantha** H. & A. Glaucesc plants with stiff coarse leafy stems 2 to 3 ft. high; leaves bipinnate, $\frac{1}{2}$ to 1 ft. long or more, the divisions cleft into narrow lobes; flowers yellow, in a large racemose panicle; corolla linear-oblong, only slightly cordate, $\frac{1}{2}$ in. long; petals distinct; capsule $\frac{3}{4}$ to $1\frac{1}{4}$

in. long, its valves at maturity separating from the placental ribs but all joined at tip into the style (or sometimes splitting up the style to the stigma); seeds crestless.

High dry ridges of the inner Coast Ranges, but not common: Lake Co.; Vaca Mts.; Mt. Diablo; and southward to San Diego. Also Sierra Nevada (Gwin Mine, Amador Co., *Jepson*.) Sometimes called "Golden Ear-drops."

2. **D. formosa** DC. BLEEDING HEART. Acaulescent; rootstock fleshy and spreading; leaves on very long petioles, biternately compound, the divisions incisely cleft or pinnatifid; scapes slightly exceeding the leaves, 2 ft. high, naked, terminated by a cluster of short racemes with subulate bracts; corolla rose-purple (rarely white), ovate-cordate; petals all united to above the middle, the larger with short spreading tips; stigma with a double pair of lobes; seeds crested.

Shady woods: Oakland Hills; Marin Co. and northward; also in the Sierra Nevada. Apr.-June. Sometimes one free filament in each set of the stamens.

D. UNIFLORA Kell. Steer's Head. Diminutive alpine herb 1 to 3 in. high with ternately lobed leaves and 1 to 2-flowered scapes from a fascicle of tubers; outer petals very narrow, recurving.—Mt. Lyell, Mt. Dana (*W. L. J.*) and far northward.

CRUCIFERAE. MUSTARD FAMILY.

Herbs with alternate leaves, no stipules and the flowers in terminal bractless racemes (or in *Tropidocarpum* with a leafy raceme). Sepals and petals each 4, regular and distinct. Petals rarely none, commonly with claws, the blades spreading in the form of a cross. Stamens 6, commonly tetradynamous (4 long and 2 short), sometimes subequal, sometimes 4 or 2. Ovary superior, 2-celled by a thin partition stretched between the placentae; style 1, stigma 2-lobed or 1. Fruit a 2-celled capsule, the 2 valves separating from below upwards, leaving behind the placentae and partition, or often 1-celled and indehiscent, or breaking up transversely into 1-seeded joints. Capsule long and narrow (a silique) or short and roundish (a silicle), commonly termed a "pod" and either terete, 4-sided, compressed (flattened parallel to the partition) or obovate (flattened contrary to the partition). Seeds in each cell attached alternately to either placenta and occupying the center of the cell (in 1 row) or disposed in 2 rows (the seeds from either placenta not overlapping each other). Embryo always curved, the caulicle folded upon the back of one of the cotyledons (incumbent) or along the edge of the cotyledons (accumbent). Herbage always with the characteristic mustard-like or pungent juice. *Streptanthus glandulosus* has a somewhat irregular flower.

A. Pod completely dehiscent by two valves.

1. Pod a silique, 3 to several times longer than broad.

Seeds in 1 row in each cell (except *Sisymbrium canescens* and *Arabis glabra*); silique linear or narrowly linear.

Racemes leafless.

Filaments with one or two pairs connate (except 1 or 2 species); silique compressed; sepals colored, commonly purple; petals purple, varying to whitish, the limb narrow, commonly undulate-crisped.....2. *STREPTANTHUS*.

Filaments all distinct.

Silique terete, pointed with a long conical beak prolonged much beyond the valves; flowers large, yellow.....5. *BRASSICA*.

Silique terete, 4-sided or compressed, tipped with a short style or pointless.

Silique narrowly linear, elongated, terete or nearly so.

Leaves coarsely toothed or some pinnatifid or entire; flowers white or yellowish.

1. *THELYPODIUM*.

Leaves for the most part pinnatifid, or the lowest pinnately parted; flowers yellow.....3. *SISYMBRIUM*.

Silique compressed; valves more or less 1-nerved; flowers purple, white or nearly white.....8. *ARABIS*.

Silique pointed, somewhat quadrangular, midrib of valve conspicuous; flowers rather small, bright yellow.....9. *BARBAREA*.

Silique 4-sided or flattened; valves 1-nerved; flowers large, pale yellow or orange.. 7. *ERYSIMUM*.

Silique compressed, pointed.

Stems sparingly leafy from a perennial, tuberous rootstock; flowers large, white to rose-tinted.....11. *DENTARIA*.

Stems leafy; annual with fibrous roots and smaller flowers.....12. *CARDAMINE*.

Racemes leafy; silique obcompressed.....13. *TROPIDOCARPUM*.

Seeds in 2 rows in each cell; silique terete, linear to oblong; flowers small (2 lines long or less), white or yellow.....10. *NASTURTIUM*.

2. *Pod a silicle, roundish or little longer than broad.*

Silicle turgid, obovoid or pear-shaped; edges of the valves narrowly margined; flowers yellowish.....15. *CAMELINA*.

Silicle much flattened contrary to the narrow partition and

Obcordate or elliptical, several-seeded; flowers white or slightly yellowish.....14. *CAPELLA*.

Didymous, the valves separating as closed 1-seeded nutlets; flowers greenish-white.. 19. *CORONOPUS*.

Orbicular or ovate, more or less emarginately winged at summit; flowers white or

apetalous.....18. *LEPIDIUM*.

B. *Pod indehiscent.*

Pod elongated, breaking transversely into 1-seeded indehiscent joints.

Pod several-seeded, commonly with constrictions between the seeds; flowers showy.... 6. *RAPHANUS*.

Pod 2-jointed, breaking in the 'middle, each joint 1-seeded; flowers small.....4. *CAKILE*.

Pod broader than long, more or less didymous, the cells indehiscent but separating from the axis when ripe.....19. *CORONOPUS*.

Pod wholly indehiscent, roundish or obovate.

Pod 1 to several-seeded, wingless.....16. *ATHYSANUS*.

Pod 1-seeded, margined with a wing.....17. *THYSANOCARPUS*.

1. *THELYPODIUM* Endl.

Ours annual herbs. Flowers white or pale yellow (straw-colored), in often dense racemes. Leaves mostly petioled, not auriculate or clasping. Petals with narrow claw and linear or obovate exerted limb. Stamens tetradynamous, exerted, with long and slender, never united filaments. Anthers narrowly linear, sagittate, curved. Stigma circular or obscurely 2-lobed, usually small. Pod elongated, terete, sessile or short-stipitate. Seeds oblong, somewhat flattened, not winged. Cotyledons incumbent. (Greek, *thelus*, female, and *pus*, foot or support, the ovary more or less stipitate.)

Cauline leaves mostly petioled; flowers $1\frac{1}{2}$ to 2 lines long.....1. *T. lasiophyllum*.

Cauline leaves sessile or the lower frequently petioled; flowers 4 to 5 lines long.

Ovary glabrous; petals conspicuously exceeding the acuminate sepals.....2. *T. Greenei*.

Ovary hairy; petals little exceeding the obtuse sepals.....3. *T. flavescentis*.

1. *T. lasiophyllum* Greene. Erect, simple or branching above, 1 to 3 ft. high, hispid with scattered hairs or nearly glabrous above; lower leaves sinuately pinnatifid with mostly acute denticulate or entire segments, 2 to 5 in. long, the upper lanceolate, less lobed or merely toothed, all petioled, or the upper rarely sessile; flowers $1\frac{1}{2}$ or 2 lines long, closely clustered, white or yellowish, on commonly curved pedicels 1 line long; sepals oblong, scarcely more than half the length of the narrow petals; pods ascending or strictly deflexed,

straight or somewhat curved, 2 to 4 in. long, $\frac{1}{2}$ line wide or less, obtuse at apex.

Coast Ranges; Sierra Nevada. Apr. A variable species.

2. **T. greenei** Jepson. Erect, 2 to 3 or even 4 ft. high, the stem with several much elongated simple branches from below the middle; herbage glaucous and glabrous; radical and lower leaves ovate or oblong-lanceolate, irregular or somewhat erosely toothed or lacinate, sometimes with two or three pairs of broad salient lobes below the middle, 8 in. long or less; petioles about 1 in. long; upper leaves linear-lanceolate, sharply serrate or denticulate, 1 to 4 in. long, sessile; racemes in flower rather dense, in fruit much elongated; flowers 4 to 5 lines long, pale yellow; sepals narrowly oblong, tapering to an acuminate apex, which often bears a few hairs; petals much exceeding the sepals, the claw broad and the undulate blade narrow; ovary glabrous; pods 2 to 3 in. long, rather less than 1 line wide, beaked by the style.

Main Prairie and Collinsville southward to the Mt. Diablo range.

3. **T. flavescens** (Hook.) Jepson. One ft. high, perhaps more; stems, petioles, midribs and margins of leaves hispidulous; leaves coarsely and unequally toothed, the lower petioled and sometimes pinnatifid, the uppermost sharply denticulate or entire; flowers yellowish, 4 lines long; sepals oblong, broadest toward the acute apex, which usually bears a few hairs; petals undulate, the claw as broad or broader than the blade, little exceeding the sepals; ovary hairy; fruit unknown to us.—(*T. hookeri* Greene.)

Livermore to Monterey. Mar.

2. STREPTANTHUS Nutt.

Annuals or a few biennials, often glaucous. Radical leaves commonly toothed or pinnatifid, the cauline similar or entire, often sagittate-clasping. Sepals usually of the same color as the petals, two or all saccate at base, the calyx thus ovoid or broad at base and contracted above, or by the spreading of the tips becoming somewhat flask-shaped, rarely subcylindric. Petals purple or white, with a narrow undulate or crisped limb and channeled claw, regular, or somewhat irregular as in no. 6. Stamens tetradynamous, or in 3 unequal pairs, the 2 longer pairs with filaments connate below or the uppermost pair with entirely united filaments. Pod narrowly linear, flattened parallel to the partition, sometimes subterete; valves 1-nerved or rarely carinate. Seeds flat, margined or winged. Cotyledons accumbent. (Greek streptas, twisted, and anthos, flower, in reference to the petals.)

Upper leaves oval or orbicular and cordate-clasping.

Filaments all distinct or one pair connate; the flowering stems from an indurated stock1. *S. suffrutescens*.

Filaments distinct; annual2. *S. orbiculatus*.

Upper leaves mostly narrow; filaments of longer stamens connate in pairs; annuals.

Herbage glabrous; 2 pairs of filaments connate.

Some lower leaves broadly ovate; flowers very short-pedicelled; petals purple and white3. *S. breweri*.

Cauline leaves all linear; petals white.

Flowers subsessile; sepals with whitish tips4. *S. barbiger*.

Flowers long-pedicelled; sepals dark purple or black5. *S. niger*.

Herbage hispid-pubescent or hirsute; upper pair of filaments connate.

Leaves mostly narrow.

Flowers purple; raceme not 1-sided6. *S. glandulosus*.

Flowers pale; raceme 1-sided7. *S. secundus*.

Some leaves obovate; petals purplish with white tips8. *S. hispidus*.

1. **S. suffrutescens** Greene. Biennial (sometimes annual?), herbage glabrous; branches 6 to 15 in. long from a stout indurated main stem 6 to 9 in.

high; lower leaves broadly oblong or cuneate-obovate, coarsely serrate-toothed, narrowed at base into a winged petiole, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; upper leaves orbicular with cordate-clasping base, $\frac{3}{4}$ to 1 in. broad; petals white, with purple veins, 4 lines long; pods arcuate, $2\frac{1}{2}$ to 3 in. long, 1 line wide.

Montane species of the Coast Ranges: Hood's Peak (Sonoma Co.) and northward to Humboldt Co.

2. **S. orbiculatus** Greene. Annual; herbage glabrous; main stem or ascending axis short, 1 to 3 in. long, bearing many ascending branches, or the branches at base spreading horizontally, 3 to 5 in. long; leaves rather small, lower spatulate-oblong, upper round, cordate-clasping; sepals pink or purple, 2 to 3 lines long; filaments distinct; pods falcate-recurved, mostly exceeding 2 in.

Mt. Diablo; Sierra Nevada from Mono Co. to Mt. Shasta.

3. **S. breweri** Gray. Stems 1 to 2 ft. high, branching from near the base; herbage glabrous and glaucous; leaves mostly sessile and clasping, the lowermost broadly spatulate with a winged petiole, toothed, the cauline broadly ovate and acute to narrowly lanceolate, denticulate or entire; flowers 3 to 4 lines long, purplish; sepals acuminate; 2 pairs of filaments connate; pods ascending, short-pediceled, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long by $\frac{1}{2}$ line broad, ascending, slightly curved; stigma sessile or nearly so; seeds small, orbicular, wholly marginless.

Inner South Coast Ranges: Mt. Hamilton, Arroyo del Puerto and Mt. San Carlos.

4. **S. barbiger** Greene. Glabrous, 1 to 2 ft. high, branched; cauline leaves linear, entire; flowers white or purple, 3 lines long, subsessile; calyx saccate; sepals connivent, with recurved whitish tips; petals white, unequal; filaments dark purple, the upper pair connate and at length exserted; pods $1\frac{1}{2}$ to 2 in. long, $\frac{1}{2}$ line wide, recurved.

Colusa Co. to St. Helena. June.

5. **S. niger** Greene. Stout, $1\frac{1}{2}$ to 3 ft. high, much branched, the herbage glabrous and glaucous; leaves linear, the lower with shallow pinnate lobes or teeth, the upper entire and auriculate-clasping; racemes loose, flexuous; flowers 4 to 5 lines long, long-pediceled; calyx broad and saccate; sepals dark purple or black, obtuse; petals white; pods ascending, 1 to 2 in. long, 1 line broad, on pedicels 6 to 12 lines long; stigma entire, sessile; seeds broadly elliptical, narrowly winged.

Hills at Tiburon, Marin Co. Apr. Seems like a robust glabrous form of *S. glandulosus*.

6. **S. glandulosus** Hook. JEWEL FLOWER. Nearly simple or branched, 1 to 2 ft. high, the herbage more or less hispid; lower leaves oblanceolate, coarsely and often saliently toothed, at least the radical slender-petioled, the upper lanceolate to linear, toothed or entire, sessile and auriculate-clasping, the teeth callous-tipped; flowers 5 to 6 lines long; calyx commonly deep purple, broad and saccate, 3 sepals connivent at tips, the lower free from the others and usually spreading; petals purple, or white with conspicuous purple veins; longest pair of filaments often connate for their entire length and with reduced anthers; pods curved, more or less spreading on short pedicels, glabrous or hispid, 2 to 3 in. long, 1 line wide; seeds elliptical, narrowly winged.

Common in the mountains at middle altitudes or at the higher altitudes in the hills. Apr.

7. **S. secundus** Greene. Either simple or with slender branches, 10 to 18

in. high, the foliage similar to that of *S. glandulosus*; racemes rather dense, secund; flowers flesh-color, 4 lines long; remote lower sepal distinctly, the uppermost obscurely, unguiculate, all carinate and commonly hispid-ciliolate on the keel; petals with ample purple-veined crisped limb; upper pair of filaments connate to near their scarcely divergent tips, their anthers small but bearing pollen; pods slender, 2 in. long, falcate-recurved; seeds wingless.

Near the coast from Marin Co. northward to Mendocino Co. June.

8. *S. hispidus* Gray. Dwarfish, hispid throughout, branching, 3 to 6 in. high; leaves obovate to connate-oblong, coarsely toothed, all sessile except the very lowest; sepals hispid with brownish hairs; petals purplish with white tips, 3 or 4 lines long; pods erect or ascending, $1\frac{1}{2}$ to 2 in. long, 1 line wide, the pedicels short, about 1 line long; style short and stigma broad; seeds elliptical, winged.

Inner Coast Range: summit of Mt. Diablo, *Brewer*, and southward to Fresno Co.

3. *SISYMBRIUM* L.

Erect annuals with pinnatifid or finely dissected leaves, the base not clasping or auriculate. Flowers small, yellow. Sepals oblong or linear, equaling or exceeding the claws of the petals. Pod linear or oblong, terete or nearly so, the valves more or less distinctly 3-nerved; stigma sessile or the style very short. Cotyledons incumbent. (Greek *sisumbrion*, the ancient name of some plant of this family.)

Leaves pinnatifid; seeds in 1 row.....1. *S. officinale*.
Leaves finely dissected; seeds in 2 rows.....2. *S. canescens*.

1. *S. officinale* (L.) Scop. HEDGE MUSTARD. Stem rigid, erect, 2 to 4 ft. high, with divaricate branches above; herbage a little rough-hispid; leaves lyrate and often somewhat runcinately pinnatifid or pinnately parted with dentate or coarsely toothed segments, petioled, the lowest rosulate and 4 to 10 in. long; flowers $1\frac{1}{2}$ to 2 lines in diameter; pods terete, 6 lines long, tapering from base to summit, nearly sessile, closely appressed to the axis in a long slender raceme.

Very common weed of waysides and waste places. Naturalized from Europe. Apr.-May.

2. *S. canescens* Nutt. TANSY MUSTARD. Nearly simple, $\frac{3}{4}$ to 2 ft. high, cinerous-tomentulose with short branching hairs, sometimes glabrate and green; leaves pinnately or bipinnately dissected, thinnish and delicate; segments small, elliptical or in the upper leaves linear-oblong; petals $\frac{3}{8}$ to 1 line long, equaling or exceeding the sepals; pods oblong to linear, acute at each end and beaked with a very short style, 3 to 6 lines long, borne on slender spreading pedicels of equal or greater length.—(*S. pinnatum* (Walt.) Jepson.)

Livermore Valley, the upper San Joaquin Valley, southward to Southern California and far eastward. Apr.

4. *CAKILE* L.

Maritime branching annual with fleshy leaves and rather small purplish or white flowers. Pod fleshy, or when ripe, dry and corky, 1-celled, jointed in the middle, the 2 joints 1-seeded, the upper joint at length deciduous, the lower one persistent. Cotyledons accumbent. (Arabic name.)

1. *C. americana* Nutt. SEA ROCKET. Stems decumbent, often 2 ft. long; leaves oblanceolate or narrowly obovate, crenate or shallowly sinuate-toothed;

pod 1 in. long or less, the lower segment cylindrical, the upper ovoid and acuminate narrowed to a flattened truncate often retuse beak.

Sea beaches near San Francisco: West Berkeley; Black Point; near Lake Merced. Introduced. June-Sept.

5. BRASSICA L. MUSTARD.

Annuals, either glabrous or sparsely hispid with coarse hairs, the lower leaves usually lyrate pinnatifid or pinnate, the upper disposed to be more or less entire. Flowers large, yellow. Lateral sepals more or less gibbous at base. Petals with long claw and abruptly spreading limb. Papilla-like glands 4, green, alternating with the claws of the petals. Pod terete, terminating in a stout beak; valves 1 to several-nerved. Seeds in 1 row, globose. Cotyledons conduplicate, incumbent. (The Latin name for cabbage. All of our species naturalized weeds.)

Pods terete, commonly 1 in. long or more, on ascending or spreading pedicels.

Beak terete; stem-leaves auriculate-clasping.....1. *B. campestris*.

Beak 2-edged, often 1-seeded, much shorter than the body; stem-leaves petioled, or the upper merely sessile, none auriculate-clasping.....2. *B. arvensis*.

Pods somewhat quadrangular, closely appressed to the axis of the raceme, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; leaves all petioled.....3. *B. nigra*.

1. *B. campestris* L. "COMMON YELLOW MUSTARD." Erect, sparingly branched, 1 to 6 ft. high; herbage succulent, glaucous, and glabrous save for some bristle-bearing pustules on the upper surface of the lower leaves; cauline leaves all sessile and clasping by an auricled base; lower leaves irregularly serrate or denticulate, and pinnatifid or pinnate with the terminal segment very large and the lateral segments sessile by a broad base and more or less decurrent on the rachis; upper cauline lanceolate and entire; flowers 6 to 8 lines broad; sepals narrowly oblong, yellowish, ascending; petals with elliptic blade; pods terete, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long, narrowed into a subulate beak, tipped with a flat stigma.

Very common. Feb.-Apr. It is the Turnip of the gardens run wild.

2. *B. arvensis* (L.) B.S.P. CHARLOCK. Herbage light green, hispid with scattered hairs; leaves pinnatifid with a large shallowly lobed terminal segment and usually a pair of much smaller angular segments on the rachis, or ovate or triangular-ovate and lobed or denticulate; upper leaves deltoid-ovate to ovate-lanceolate, petioled or sessile by a narrow base, not clasping; petals 4 to 6 lines long; pods ascending or erect, 1 to $1\frac{1}{2}$ in. long, with 3 to 8 seeds in each cell; beak flattish, $\frac{1}{3}$ as long as the body, often containing a seed; valves nerved.—(*B. sinapistrum* Boiss.)

Western Alameda Co.; abundant in alfalfa fields at Yreka, *Butler*. Apr.

3. *B. nigra* (L.) Koch. BLACK MUSTARD. Dark green (not glaucous), nearly glabrous or with some scattered stiff hairs, 3 to 6 or even 12 ft. high; leaves all petiolate; lower lyrate pinnatifid or divided; terminal segment very large, shallowly lobed and sharply dentate; upper leaves less lobed or the uppermost linear and entire and commonly drooping or pendulous; racemes long and dense; petals $3\frac{1}{2}$ lines long, much longer than the sepals; pods closely appressed to the axis of the raceme, torulose, indistinctly 4-sided, beaked by the style; seeds nearly black, highly pungent.

Everywhere common. Very abundant in interior grainfields. May-July.

6. RAPHANUS L. RADISH.

Coarse much-branched annuals or biennials. Lower leaves lyrate pinnate or pinnatifid, shortly petioled. Flowers large, purple or yellow, or becoming white.

Petals long-clawed. Pod thick, beaked by the stout style, 1-celled, filled with spongy or corky tissue, lightly constricted between the seeds or even moniliform, indehiscent or eventually breaking transversely into 1-seeded joints. Seeds subglobose, cotyledons conduplicate. (Greek raphanos, quick-appearing, on account of the prompt germination of the seeds.)

Flowers purple, pink or white; pod with shallow constrictions, 2 to 3-seeded.....

Flowers yellow or white; pod moniliform, 4 to 10-seeded.....2. *R. raphanistrum*.

1. *R. sativus* L. WILD RADISH. Branching widely, 2 to 5 ft. high; herbage nearly glabrous or hispid with scattered hairs; lower leaves pinnately parted, crenate, the terminal segment large and round, the lateral smaller, ovate or oblong, sessile with the upper side adherent to the midrib, the lower lobe free; upper leaves mostly toothed, or with a few small lateral segments; flowers 8 or 9 lines broad, purple or white; pods 3 to 4 lines broad, 1 to 3 in. long, with one to several constrictions, or the body of the pod globose and 1-seeded.

Common weed of waste places in towns and villages about San Francisco Bay; less frequent in the interior. Naturalized from Europe.

2. *R. raphanistrum* L. JOINTED CHARLOCK. Plants 1½ to 2 ft. high, almost glabrous throughout; lower leaves deeply lyrate-pinnatifid, 4 to 7 in. long, the upper less lobed; flowers 6 to 9 lines broad, yellow or white; pods 1 to 1½ in. long, 6 to 10-seeded, strongly constricted between the seeds, longitudinally grooved.

European weed. Reported at San Francisco seventeen years ago but still rare. Appeared at Berkeley in 1899 and in Sacramento Co. (Elk Grove) in 1883.

7. *ERYSIMUM* L. WALL FLOWER.

Erect stoutish biennials or perennials, simple or with few branches. Leaves narrow, entire, dentate or lobed. Flowers large, orange to light yellow. Sepals narrow, equal at base or the lateral saccate. Petals with slender claws and obovate blades. Pod linear, flattened, with 1-nerved valves, or quadrangular. Seeds in 1 row, numerous, not margined. (Greek name of a garden plant.)

Flowers orange; pod 4-sided; montane species.....1. *E. asperum*.
Flowers cream-color or yellowish; pod flattened parallel to the partition; littoral species..

2. *E. capitatum*.
1. *E. asperum* DC. WESTERN WALL-FLOWER. Herbage scabrous-pubescent, hairs stellately 3-parted; stems erect, simple or branching above, 1¼ to 2½ ft. high, rather densely clothed with leaves below; leaves narrow (2 to 6 lines wide and 3 to 6 in. long, or the uppermost shorter), entire or sharply dentate, the lower slender-petioled; flowers orange, 10 lines in diameter; blade of petal broadly elliptic; sepals narrow, with a longitudinal dorsal ridge; pods 4-sided, ascending or widely spreading, commonly 3 to 4 in. long, 1 line wide, beaked with a stout style; seeds oblong, often slightly winged at one end.—(*E. californicum* Greene.)

Common on rocky hills: Coast Ranges, Sierra Nevada. Mar.-Apr.

2. *E. capitatum* (Dougl.) Greene. Stout and low, erect, ½ to 1½ ft. high, leafy, finely pubescent; leaves narrow, entire or repand-dentate; flowers cream-color to yellowish, rarely white, at first sub-capitate, the axis elongating in fruit and becoming a short raceme; pods 1½ to 2½ in. long, 1½ lines wide, abruptly short-pointed; valves flattish, 1-nerved; seeds brown, sometimes margined but not winged.—(*E. grandiflorum* Nutt.)

Vicinity of the ocean along the California coast.

8. ARABIS L. ROCK CRESS.

Ours erect and tall annuals or biennials, or caespitose perennials. Flowers rose-purple, white or yellowish white. Sepals greenish or purplish, erect and equal, or the lateral pair slightly saccate at base. Petals obovate or spatulate, with narrow claw and flat blade, commonly much exceeding the sepals. Pod flattened parallel to the partition, the valves more or less 1-nerved. Seeds more or less winged; cotyledons accumbent, or in one species partially incumbent. (Name from the land Arabia.)

Leaves all pinnately parted; plants decumbently branching from the base; flowers small, white1. *A. virginica*.
Leaves entire, toothed or only the radical pinnatifid.

Tall biennials with white flowers; sepals greenish.

Glaucous; glabrous except at the base.....2. *A. glabra*.

Not glaucous; hirsute throughout.....3. *A. hirsuta*.

Low, more or less tufted perennials; sepals purplish, rarely greenish.

Herbage dark green, mostly glabrous; pods nearly straight; seaboard species.....4. *A. blepharophylla*.

Herbage more or less canescent; pods arcuate; montane species.....5. *A. breweri*.

1. *A. virginica* (L.) Trelease. Annual or biennial, nearly glabrous; branched from the decumbent base, the branches 7 to 15 in. high; leaves deeply pinnatifid with nearly uniform oblong or linear few-toothed or entire segments; flowers small, white, on very short pedicels; pods spreading, $\frac{3}{4}$ to 1 in. long, 1 line broad, borne on pedicels 1 to 2 lines long, beaked by a short pointed style; valves faintly veined or obscurely 1-nerved at base; seeds in 1 row.—(A. ludoviciana C. A. Mey.)

Lower San Joaquin River banks, *Sanford*; probably introduced from Southern California.

2. *A. glabra* (L.) Bernh. TOWER MUSTARD. Biennial; stems bluish green, erect, simple (very rarely branched), 2 to 4 ft. high; herbage glaucous, at the base hispidulous, above glabrous; radical leaves broadly spatulate, coarsely dentate or merely denticulate, 2 to 4½ in. long, soon withering; cauline leaves ovate or ovate-lanceolate, entire, clasping by a sagittate base; flowers dull white, 2 to 3 lines long, little exceeding the sepals; pods strictly erect, even appressed to the stem, straight, 3 to 4 in. long, $\frac{1}{2}$ to $\frac{3}{4}$ line wide, on pedicels 3 to 5 lines long; seeds in 2 rows, narrowly winged or wingless.—(A. perfoliata Lam.)

Throughout California: not rare, but the plants commonly solitary. Apr.-May.

3. *A. hirsuta* Scop. HAIRY ROCK CRESS. Biennial, more or less hirsute, deep green, not glaucous; stems erect, simple or strictly branched, 1 to 3 ft. high; radical leaves oblanceolate, the petioles winged, 1 to 2 in. long; cauline oblong to lanceolate, commonly entire, sessile by a subcordate base; petals dull white, 1½ to 3 lines long; pods strictly erect on slender pedicels, 1 to 2 in. long, $\frac{1}{2}$ line wide; style scarcely any; valves faintly nerved below the middle and more or less veined; seeds suborbicular, very narrowly margined.

Northern California: Marin Co. (acc. to Greene.)

4. *A. blepharophylla* H. & A. Biennial or perennial, branched at base or simple, 4 to 12 in. high, deep green, glabrous, or somewhat hirsute below; leaves ciliate with forked hairs, the radical broadly spatulate to obovate, obtuse, the cauline oblong, sessile, dentate or entire; flowers large, fragrant, pur-

ple, $\frac{1}{2}$ in. long; sepals often colored, broad, 2 to 3 lines long; pods erect or ascending, nearly straight, $\frac{3}{4}$ to 1 in. long, 1 line wide, abruptly beaked by a short stout style; valves veined, 1-nerved; seeds in 1 row, round-elliptical, narrowly winged or scarcely margined.

Rocky hilltops near the sea from San Francisco to Monterey. Mar.-Apr.

5. **A. breweri** Wats. BREWER ROCK CRESS. Stems many from the much branched crown of a stout woody root, 2 to 6 in. high; herbage stellately pubescent or canescent, especially below; lower leaves broadly spatulate, entire, 3 to 9 lines long; upper leaves lanceolate to oblong, sessile by a subcordate base or obtusely auriculate; flowers bright red-purple or nearly white, 2 to 3 lines long, the pedicels and purplish calyx more or less villous; pods spreading and arcuate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, 1 line broad; valves 1-nerved, veined; seeds orbicular, narrowly winged, somewhat in 2 rows.

Rocky summits of mountain peaks from borders of Lake Co. southward to Mt. Diablo, Mt. Hamilton and Loma Prieta. Apr.

9. BARBAREA R. Br.

Perennial herbs similar to the yellow-flowered Nasturtiums. Stem angular. Leaves lyrate or pinnatifid. Stamens 6, distinctly tetradynamous. Pod linear, somewhat quadrangular, abruptly terminated by a pointed style, the valves strongly 1-nerved or carinate. Seeds in 1 row in each cell, turgid, not margined. (Named after St. Barbara.)

1. **B. vulgaris** R. Br. WINTER-CRESS. Glabrous, rather stout, 10 to 16 in. high; radical leaves elliptic, sometimes cordate at base, $\frac{3}{4}$ to 2 in. long, with or without small supplementary lobes borne along the petiole; cauline similar, pinnatifid, with the terminal lobe largest and often oblong-lanceolate; raceme terminal and solitary or with several from the upper axils; petals narrowly obovate or oblanceolate, the blade scarcely narrowed into a claw, about 3 lines long, twice as long as the yellow sepals; pod $1\frac{1}{2}$ in. long.

Along mountain or hill streams: Coast Ranges and Sierra Nevada. June-July.

10. NASTURTIIUM L.

Nearly or quite glabrous annuals or perennials, sometimes growing in water, mostly in wet places. Leaves toothed or pinnatifid or pinnately divided. Flowers small, white or yellow. Sepals spreading in anthesis. Petals scarcely clawed. Stigma capitate, nearly sessile. Pod linear or oblong, terete or nearly so, valves mostly 1-nerved. Seeds minute, in 2 rows in each cell; cotyledons accumbent. (Latin, *nasus*, nose, and *tortus*, twisting, the nostrils affected by the pungent herbage.)

Flowers white; petals distinctly clawed, nearly twice the length of the sepals.....

1. *N. officinale*.

Flowers yellow; petals scarcely clawed, little longer than the sepals.

Pods linear, curved upward.....2. *N. curvisiliqua*.

Pods oblong, turgid, straight.....3. *N. palustris*.

1. **N. officinale** R. Br. WATER-CRESS. Stems ascending or prostrate at base and rooting at the nodes, the herbage glabrous; leaflets or segments 3 to 9, ovate or nearly round, the terminal always the largest, or the lowest leaves without lateral leaflets; flowers white, 2 to $2\frac{1}{2}$ lines broad; petals nearly twice the length of the sepals; pods divaricately spreading, $\frac{1}{2}$ to 1 in. long, the pedicels about as long.

Abundant in slow-flowing creeks (especially where not bordered by trees) and about springs in the mountains. Naturalized from Europe.

2. *N. curvisiliqua* Nutt. WESTERN YELLOW-CRESS. Stems branching, erect or decumbent, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long; herbage sparsely pubescent; leaves pinnatifid or pinnately parted (the segments varying from linear and commonly entire to oblong or ovate and either entire, toothed or pinnatifid), mostly $\frac{3}{4}$ to 2 in. long, or the lowest or radical much longer; pods linear, terete, more or less curved, 4 to 7 lines long, the pedicels $\frac{1}{2}$ to $1\frac{1}{2}$ lines long.

Frequent in stream beds, margins of pools and marshy places, from San Mateo Co. and the Oakland Hills northward through the Coast Ranges and the Sacramento Valley. Exceedingly variable in foliage.

3. *N. palustris* DC. MARSH YELLOW-CRESS. Biennial, erect, branching, 2 to 5 ft. high, usually glabrous; leaves oblong-lanceolate in outline, coarsely toothed or deeply pinnatifid with the oblong lobes dentate; pods oblong, turgid, 2 to 3 lines long, obtuse, the pedicels nearly as long.

Lowlands of the Sacramento River.

11. DENTARIA L. TOOTHWORT.

Glabrous perennials. Stems and one or two long-petioled radical leaves from tuberous rootstocks, the stems rarely branched and sparingly leafy. Flowers large, white or rose-tinted. Petals with slender claws and ovate spreading limb, much longer than the sepals; these equal at base, erect or nearly so. Pod linear, flattened, parallel to the partition, stout, attenuate above into the slender style, the valves and partitions not nerved; seeds wingless. (Latin, dens, a tooth, the rootstocks toothed in some species.)

Leaves (at least the cauline) trifoliate.....1. *D. integrifolia*.
Leaves all undivided.....2. *D. cardiophylla*.

1. *D. integrifolia* Nutt. MILK-MAIDS. Stems mostly one from the rootstock, erect, 1 ft. high, the herbage rather fleshy; radical leaves simple or trifoliate, the leaves or leaflets mostly orbicular, minutely dentate, and $\frac{1}{2}$ to 1 in. long; cauline trifoliate, the leaflets ovate to lanceolate; raceme mostly single; corolla white, 6 lines broad; sepals green or dull red; siliques with dull red valves.

Abundant in the valleys and on the plains, often whitening the fields in Feb. and Mar. Variable.

2. *D. cardiophylla* (Greene) Robinson. Erect, stoutish, 8 to 13 in. high; radical leaves undivided, broadly cordate, slightly and somewhat angulately lobed and mucronately denticulate, 1 to $2\frac{1}{2}$ in. wide; cauline similar, tapering from within the broad sinus to a petiole $\frac{1}{2}$ to 1 in. long; flowers white; siliques slender-beaked.

Vaca Mts. at low altitudes, Jepson (1885), Platt (1898).

12. CARDAMINE L. BITTER-CRESS.

Ours annual with fibrous roots and leafy stems; leaves pinnate, the radical in a rosette. Very near *Dentaria* and scarcely separable, but the flowers smaller (in ours 1 to $1\frac{1}{2}$ lines long) and pods narrower. (Ancient Greek name of some species of *Cress*.)

1. *C. oligosperma* Nutt. Erect, slender, unbranched or branching, 3 to 14 in. high, hispidulous or glabrous; radical leaves in a rosette, these and the cauline leaves pinnate, $1\frac{1}{2}$ in. long or less; leaflets 5 to 11, little unequal, with a notch in each side toward the apex, 1 to 4 lines long, petiolulate; petals white, much surpassing the sepals; silique 6 to 9 or 12 lines long; valves separating

and falling in a close coil while still green-herbaceous; pedicels 2 lines long, little accrescent in fruit.

Under oaks and other trees in openly wooded country. Oakland Hills and Marin Co. to Napa Valley and Mendocino Co. and far northward.

13. TROPIDOCARPUM Hook.

Erect or diffusely spreading annuals with pubescent herbage, pinnatifid leaves and leafy racemes of rather small yellow flowers. Sepals concave, ovate-oblong, spreading. Petals cuneate-obovate. Stamens tetradynamous; anthers roundish. Style slender, sometimes short. Pod completely or partially 2-celled, or 1-celled, strongly flattened contrary to the narrow partition, or only the upper part flattened, or somewhat inflated; valves 2 to 4, opening from above; seeds in 2 to 4 rows. (Greek tropis, keel, and karpos, fruit, in reference to the carinate valves of the capsule. For an interesting study of the fruit of *Tropidocarpum* see Robinson in *Erythea*, iv. 109.)

Plants, when robust, with mostly straggling branches; pods 2-valved and

Two-celled1. *T. gracile*.
One-celled, but the partition persistent above.....2. *T. dubium*.
Plants commonly erect; pods 4-valved and 1-celled.....3. *T. capparideum*.

1. *T. gracile* Hook. Erect or at last very diffuse; leaves pinnatifid, the segments commonly linear, acutish, cleft or entire; leaves of the inflorescence similar but reduced; pedicels axillary, 3 to 10 lines long, spreading; stamens very unequal; pods linear, strongly obcompressed throughout, tardily dehiscent; style slender; seeds in 2 rows.

On or near low hills of the inner Coast Ranges from Tehama Co. and the Marysville Buttes southwestward to Vacaville, Mt. Diablo and Southern California. Although a native it finds improved conditions of existence in the lower San Joaquin Valley, an agricultural region (E. W. Hilgard, 1890).

2. *T. dubium* Davidson. Decumbent, the branches 6 to 12 in. long; radical leaves regularly pinnatifid with 3-toothed segments, petioled, 2 to 3 in. long; cauline leaves mostly sessile, with linear segments; stamens tetradynamous, but not markedly unequal; pedicels said to be arcuate; pods $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, 1 line wide, only the upper portion obcompressed; partition not present, except in the upper third or fourth.

Eastern Contra Costa Co. and Southern California.

3. *T. capparideum* Greene. Stem stoutish, erect, mostly less than 1 ft. high, simple or sparingly branched; foliage as in *T. gracile*, the upper leaves somewhat more deeply parted and with longer subtentive segments; pods linear-oblong, 7 to 10 lines in length, 2 lines wide, somewhat inflated, 1-celled, conspicuously 6-nerved, tipped with a slender style; valves 4, the dehiscence beginning at the apex; seeds in 4 distinct rows.

Alkaline soil from Byron to Lathrop.

14. CAPSELLA Medic.

Slender annuals with pinnatifid leaves and small white flowers. Petals small, little exceeding the sepals. Pod obcordate or elliptical, strongly or scarcely at all flattened, several-seeded; valves carinate. Seeds not winged; cotyledons incumbent. (Latin capsella, a little box, in allusion to the fruit.)

Pod obcordate, or cuneate-triangular in outline with retuse apex, strongly flattened.....

1. *C. bursa-pastoris*.
Pod elliptic-oblong, scarcely flattened, entire at the apex.....2. *C. procumbens*.

1. *C. bursa-pastoris* Moench. SHEPHERD'S PURSE. Stems erect, simple or branching, 3 to 10 or 15 in. high, sparsely hispid; radical leaves in a

spreading rosette; lower leaves petioled, pinnatifid, rarely entire, the terminal lobe largest; upper leaves merely dentate, sessile-auriculate; petals white, $\frac{3}{4}$ to $1\frac{1}{2}$ lines long; pedicels elongating in fruit, 4 lines long; pods obovate, $2\frac{1}{2}$ to 3 lines broad, many-seeded, strongly flattened.

Common in pastures, orchards and by waysides; naturalized from Europe. Variable.

2. **C. procumbens** (L.) Fries. Three to 6 in. high with ascending branches from the base; leaves oblanceolate or spatulate, or the lower more or less pinnatifid; flowers minute, $\frac{1}{2}$ line long or less; sepals ovate-elliptic, thin-margined, about equaled by the white petals; pods elliptic-oblong, entire at the apex, 1 to $1\frac{1}{2}$ lines long; pedicels filiform, in fruit 3 or 4 lines long and divaricately spreading.—(*C. divaricata* Walp.)

Alkaline soil from Vallejo (acc. Bot. Cal.), Alameda and Byron southward to Kern Co.

15. CAMELINA Crantz.

Erect annual with sagittate-clasping leaves. Flowers small, yellow, in loose racemes. Pod obovate or pear-shaped, beaked with the slender, persistent style; valves convex with the edges flattened, forming a narrow margin around the pod; partition broad; seeds several in each cell, oblong, marginless; cotyledons incumbent. (Greek camai, dwarf, and linon, flax.)

1. **C. sativa** Crantz. FALSE FLAX. Stem simple or branching above, $1\frac{1}{2}$ to 2 ft. high, leafy, nearly glabrous; leaves oblong to lanceolate, entire or dentate; flowers rather small, light yellow; pedicels in fruit ascending; pods $3\frac{1}{2}$ or 4 lines long, 2 to $2\frac{1}{2}$ lines broad.

Old World weed of grain fields: Siskiyou Co., Butler; Berkeley acc. Greene.

16. ATHYSANUS Greene.

Low annual, leafy below, the short stem divided at or near the base into few or many simple elongated filiform branches or racemes which are unilaterally flower-bearing throughout. Flowers minute, promptly reflexed or recurved. Petals linear or none. Stamens 6, nearly or quite equal; filaments slender. Pod small, orbicular, indehiscent, 1-celled, or 2-celled by a thin partition, wingless; cotyledons accumbent. (Greek a-, without, and thusanos, fringe, the fruit wingless, the type species taken out of the genus *Thysanocarpus*, whose fruit is broadly margined.)

Pods plane, numerous on the racemes.....1. *A. pusillus*.
Pods flattened at maturity; racemes lax, the pods often distant 1 in. or more.....

2. *A. unilateralis*.

1. **A. pusillus** (Hook.) Greene. Plants 4 to 12 in. high; herbage pubescent with simple or branching hairs; racemes 3 to 9 in. long; leaves broadly oblong with about 3 coarse teeth on each side, 3 to 5 lines long, rarely varying from 2 to 9 lines; ovary 1-celled; ovules 2 to 4, only one maturing, that attached at base of the pod; fruiting pedicels recurved, 1 to 3 lines long; pods orbicular, strongly flattened $\frac{3}{4}$ to 1 line long, hispid all over with hooked hairs.—(*Thysanocarpus pusillus* Hook.)

Common everywhere on low hills and gravelly plains in the Coast Ranges; also occurring in the Sierra Nevada foothills.

2. **A. unilateralis** (Jones) Jepson. Habit of the preceding; racemes lax, diffuse, or horizontal and trailing, in age rigid and wiry, 6 to 18 in. long; pods round-oval, 1 to $1\frac{1}{2}$ lines broad, hispidulous, twisted when mature, the pedicels thick, recurved, $\frac{1}{2}$ to 1 line long; seeds 6 to 10.—(*Draba unilateralis* Jones.)

Hillsides and valleys of the interior and of the inner Coast Ranges from Colusa Co. to Livermore Valley and southward. Apr.

17. THYSANOCARPUS Hook.

Slender erect annuals with the stems commonly sparingly branched or often simple, and minute white or purplish flowers. Sepals ovate, spreading. Petals spatulate. Stamens 6, subequal, with slender filaments. Ovary 1-celled, 1-ovuled, becoming an indehiscent fruit; this much flattened and winged, orbicular in outline, the body disk-shaped or plane on one side and convex on the other, the wing with small holes or perforations or with radiating nerves (rays) or toothed. (Greek thusanos, fringe, and karpós, fruit.)

Fruiting pedicels more or less recurved their whole length.

Wing of the obovate fruit with radiating nerves, mostly without holes.....

Wing of the commonly roundish fruit perforated.....

Wing of fruit scarious, not perforated, the radiating nerves none or very short.....

Fruiting pedicels straight or recurved only at the very tip; wing broad with conspicuous rays.....

1. **T. curvipes** Hook. FRINGE-POD. Slender, 1 to 1½ ft. high, more or less pubescent or hirsute; cauline leaves linear or lanceolate, sessile and auricled at base, the upper entire, the lower dentate or denticulate; radical leaves often narrowed at base to a petiole, commonly sinuate-pinnatifid, with triangular acute or acuminate lobes; fruit obovate varying to round-obovate, pubescent or glabrous, 1½ to 3 lines long, often very convex on one side; wing narrow, rather crowded with broad rays; pedicels recurved.

Frequent everywhere in the open hill country of California. Apr.-May.

2. **T. elegans** F. & M. LACE-POD. Rather stout, with few branches; lower leaves repand-toothed; fruit nearly orbicular, 3 to 4 lines long, the body densely tomentose; wing with large ovoid perforations between the rays, the margin membranaceous and entire.

Middle North Coast Ranges; Antioch; Sierra Nevada foothills.

3. **T. emarginatus** Greene. Freely branching from the base, 1½ ft. high; herbage ostensibly glabrous but the plant at the fruiting stage hispidulous under a lens, at least on the lower parts; cauline leaves linear, lanceolate, sessile, not auricled; flowers and radical leaves unknown; fruit 2 to 2½ lines long, glabrous; the wing scarious, entire, destitute of radiating nerves or these very short, sometimes deeply, always slightly emarginate at the apex.

Mt. Diablo; Antioch. Too near to and evidently passing into *T. curvipes*.

4. **T. radians** Benth. Rarely branching, 1 to 1½ ft. high; radical leaves runcinate-pinnatifid, the cauline ovate-lanceolate, auriculate-clasping; fruit orbicular, 4 lines broad, glabrous or tomentose, the edge of the body divided into radiating spoke-like nerves which disappear abruptly just within the margin of the white-membranaceous wing; pedicels straight, abruptly recurved at the very summit.

Low hills or rolling plains, infrequent, but widely distributed in central California: Healdsburg; Sonoma; Vacaville; Antioch; Linden. Apr.-May.

ALYSSUM MARITIMUM (L.) Lam. Sweet Alyssum. Low branching perennial herb with narrowly lanceolate or linear leaves and white flowers 2 lines long; petals twice as long as the deciduous sepals; filaments not toothed; pod orbicular, 2-seeded.—An escape from the gardens. **A. CALYCINUM** L. Small Alyssum. Annual with decumbent branches; petals yellowish white, scarcely exceeding the sepals; sepals persistent about the base of the fruit; filaments

of the shorter stamens toothed at base.—Naturalized at Yreka, *Butler*; said to be adventive in the Bay region.

18. *LEPIDIUM* L. PEPPER-GRASS.

Ours low annuals (one perennial) with toothed or pinnatifid leaves and very small flowers (1 line long or less). Petals white or none. Stamens 6, 4 or 2. Pod a round, ovate, or broadly oblong silicle, strongly obcompressed, and in ours notched or lobed at the more or less winged apex; valves acutely carinate, the cells 1-seeded. Style not persistent in fruit. Cotyledons incumbent. (Greek *lepidion*, a little scale, in reference to the flattened pods.)

Silicle notched at apex, not reticulated or only faintly.

Petals present; erect plants.

Leaves toothed; pedicels terete.....1. *L. medium*.

Lower leaves pinnatifid; pedicels flattened.....2. *L. nitidum*.

Petals none; plants diffuse or prostrate; leaves pinnatifid.....3. *L. bipinnatifidum*.

Silicle winged at apex with two lobes or teeth and

Conspicuously reticulated; dwarfs with mostly prostrate or decumbent stems; wings or teeth approximate or parallel and

Nearly as long as the body.....4. *L. latipes*.

Very short.....5. *L. dictyotum*.

With finer reticulations; teeth divergent.

Pedicels erect or ascending, shorter than the silicles; teeth very prominent; sinus triangular.....6. *L. strictum*.

Pedicels spreading or retrocurved, longer than the silicles; sinus broad and rounded...7. *L. oxycarpum*.

L. DRABA L. Hoary Cress. Perennial, with grayish herbage; stems several from the ground, 1 ft. high, leafy below and branching at summit so as to form a panicle of racemes; leaves large, ovate, sagittate-clasping at base and with scattered minute teeth on the margin; pod somewhat cordate, neither notched nor winged.—Garden plant, occasional as an escape in the Bay region; Menlo. Thoroughly naturalized and filling fields at Yreka, *Geo. D. Butler*.

1. *L. medium* Greene. TALL PEPPER-GRASS. Stem erect, 1 to 2 ft. high, simple below, paniculately branching above and bearing numerous racemes 2 to 3 or even 6 in. long; herbage ostensibly glabrous; leaves oblanceolate (the radical oblong), narrowed at base to a petiole, sharply serrate, 2 to 3 in. long; rameal leaves linear, serrate only towards the apex, shorter; petals white; silicles round, $1\frac{1}{2}$ lines long, nearly as broad, notched at the very narrowly winged apex; pedicels 2 lines long, widely (or even horizontally) spreading.

Common in Scott Valley, Lake Co., and southward to Napa Valley. Widely distributed in the western U. S.

2. *L. nitidum* Nutt. COMMON PEPPER-GRASS. TONGUE-GRASS. Branching from or near the base, 1 to 6 (or 10) in. high, the branches mostly simple; herbage glabrous; leaves 4 in. long or less, the upper almost or quite entire, the lower pinnatifid with the rachis ligulate and bearing remote entire or laciniately toothed lobes; petals white, less than 1 line long, obovate, with no distinct claw; stamens 6, but the 2 shorter mere rudiments; silicles round, with a narrow margin, abruptly notched at apex, $1\frac{1}{2}$ to 2 lines long, plane on the upper face, convex on the lower, often dark purple, glabrous and shining.

Common everywhere on the California plains, low hills and in the valleys. North to Washington. Feb.-Apr.

3. *L. bipinnatifidum* Desv. WAYSIDE PEPPER-GRASS. Stems 3 to 6 in. long, freely branching from the base, diffuse or even prostrate, the plants often closely matting the ground; herbage light green, puberulent or glabrate; leaves pinnatifid or the lowest bipinnatifid; racemes numerous, dense and rather narrow; petals none; silicles round, nearly $1\frac{1}{2}$ lines long, glabrous, faintly

reticulate, the teeth at the apex short and obtuse; fruiting pedicels ascending, scarcely exceeding $\frac{1}{2}$ line.—(*L. menziesii* of Bot. Cal.)

Common in hard beaten soil, by paths and waysides, throughout California. Naturalized from South America.

4. ***L. latipes*** Hook. LONG-WINGED PEPPER-GRASS. Stems several from the base, very thick and stout, 1 to 2 in. long, recurved-prostrate; herbage slightly pubescent; leaves pinnatifid with few linear often toothed segments, 3 to 5 in. long, the rachis ligulate, 2 lines broad, often dilated into a terminal lanceolate lobe; segments remote, 5 to 6 lines long; racemes very dense and often capitate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; petals broadly spatulate, greenish, rounded at the apex, 1 line long, much exceeding the short sepals; silicles broadly oblong or oval, 3 lines long, 2 lines broad, strongly reticulated, sparingly pubescent, winged at apex with two broad acute teeth nearly as long as the body, the sinus between the teeth or wings a narrow cleft.

Beds or margins of winter pools on the plains or in alkaline flats: Willows; College City; Round Valley; St. Helena; Elmira; Martinez; Hollister and southward to Southern California. Mar.-May.

5. ***L. dictyotum*** Gray. Branches several from the base, decumbent, or at length ascending, 1 to 2 in. long; leaves pinnatifid, the segments few, linear and remote; petals little exceeding the sepals or wanting; silicles $1\frac{1}{2}$ lines long, broadly elliptic, finely reticulated, pubescent, with short obtuse wings or teeth at the summit, the sinus narrow; pedicels ascending, flattened.

Alkaline soils from Alameda (acc. to Greene) and Livermore southward to Southern California. Mar.-Apr.

6. ***L. strictum*** Rattan. Branching from the base, the branches comparatively simple, suberect or diffuse, 4 to 12 in. high; leaves with few pinnate segments or entire; stamens 4; silicles glabrous, lightly reticulated, 2 to $2\frac{1}{2}$ lines long, with 2 widely divergent lanceolate wings or teeth at apex often $\frac{1}{2}$ as long as the elliptic body; pedicels flattened, in fruit rather shorter than the pod.

Lower San Joaquin Valley and the Montezuma Hills.

7. ***L. oxycarpum*** T. & G. Very slender, branched from the base, the branches elongated, erect or ascending, 4 to 6 in. long, bearing flowers more than half their length; leaves narrow, linear and subentire, or pinnatifid with a few acute linear segments; sepals very unequal, caducous, $\frac{1}{2}$ line long; petals none; stamens 2; silicles roundish, glabrate, finely reticulated, $1\frac{1}{4}$ lines long, tipped with 2 very short and acute widely divergent teeth; pedicels widely spreading or retrocurved, very slender, flattened, $1\frac{1}{2}$ lines long.

19. CORONOPUS Gaertn.

Prostrate annuals (exhaling a heavy-scented odor), with pinnatifid leaves and short racemes of minute greenish white flowers. Sepals oval, equal at base, spreading. Stamens often only 2 or 4. Silicle small, more or less didymous, flattened contrary to the narrow partition, the surface strongly wrinkled or tuberculate; valves of the pod falling away at maturity from the persistent axis as closed or nearly closed nutlets. Cotyledons incumbent. (Greek *korono*, crown, and *pous*, foot, because of the shape of the leaves.)

Fruit notched at summit and at base, strongly didymous, wrinkled.....1. *C. didymus*.
Fruit not notched above, obscurely didymous, strongly roughened and cristate-muricate

2. *C. ruellii*.

1. ***C. didymus*** (L.) Smith. WART-CRESS. Herbage heavy-scented, sparse-

ly hairy or almost glabrous; stems numerous, freely branching, diffuse or prostrate, 1 to 2 ft. long; leaves 1 in. long or less, pinnately parted into entire or sharply toothed segments; flowers minute, greenish white; pods small, about 1 line broad, notched both above and below, thus appearing transversely 2-lobed or didymous, each lobe turgid and finely wrinkled.—(*Senebiera didyma* Pers.)

Naturalized South American weed, near dwellings: Montezuma Hills; San Francisco; Berkeley, 1900; Sonoma Co., 1897; Bolinas Bay, 1896; Amador Co., 1892.

2. **C. ruellii** All. SWINE-CRESS. Stems stouter; leaves pinnately parted (the segments mostly $\frac{1}{2}$ in. long and deeply 2 or 3-toothed), long-petioled, 2 to $2\frac{1}{2}$ in. long; pods flattened, $1\frac{1}{2}$ to $1\frac{3}{4}$ lines broad, not notched at summit nor scarcely 2-lobed but strongly roughened, both muricate and cristate.—(*Senebiera coronopus* Poir.)

Naturalized European weed: San Francisco.

CAPPARIDACEAE. CAPER FAMILY.

Our herbs with palmately compound alternate leaves and fugacious or deciduous stipules. Flowers complete, in bracted racemes. Sepals 4, sometimes united at base. Petals 4. Stamens in ours 6 (in other genera often many), more or less unequal, commonly inserted on the very base of the calyx, or hypogynous. Ovary raised on a stipe, 1 or 2-celled, composed of 2 carpels. Valves in fruit separating from the placentae and releasing the many seeds, or the valves 1-seeded and separating from the axis as nutlets.

CLEOMELLA OBTUSIFOLIA Torr. Branching annual with 3 leaflets and tufts of deciduous bristles for stipules; flowers yellow; pods 1-celled, small, few-seeded, with the valves produced laterally into acute horns.—Mohave Desert.

1. **WISLIZENIA** Engelm.

Erect branching rank-scented annuals. Leaves with 3 leaflets and with minute deciduous bristles for stipules. Flowers yellow. Stamens with long filiform filaments, much exerted. Stipe in fruit refracted upon the pedicel. Pod 2-seeded and didymous; each valve closely contracted upon its seed and falling away with it, therefore like a nutlet. (Dr. A. Wislizenus, who collected in early days in California.)

1. **W. refracta** Engelm. STINK-WEED. One to 2 (or 6) ft. high; leaflets obovate to oblong, 4 to 9 lines long, rather longer than the petiole; raceme dense, in age usually much elongated; petals $1\frac{1}{2}$ lines long; stamens and ovary exerted; pods $1\frac{1}{2}$ to 2 lines broad, the lobes strongly divergent and crested or toothed at apex, the cells separated by a partition with a single rather large perforation; stipe in fruit 2 to 4 lines long; style persistent and bristle-like.

Sacramento to Lathrop and southward in the San Joaquin Valley. A bee plant, called by some bee-keepers, "Jackass Clover." Said to bloom heavily only every other year.

CRASSULACEAE. STONE-CROP FAMILY.

Succulent herbs with entire exstipulate leaves. Flowers in cymes, small, perfect and regular. Sepals, petals and pistils of the same number (in ours 4 or 5), and the stamens as many or twice as many. Petals generally slightly perigynous, distinct or united at base. Fruit consisting of dry many-seeded follicles. Receptacle usually with nectar-bearing scales on the receptacle, one behind each pistil.

Leaves opposite; the stamens as many as the petals; diminutive annuals.....1. *TILLAEA*.
 Leaves alternate, the basal in conspicuous rosettes; stamens twice as many as the petals.

Perennials or annuals; petals distinct; follicles often spreading when fully ripe.....

2. *SEDUM*.
 Perennials, coarser than the last; petals more or less united at base; follicles erect or suberect3. *COTYLEDON*.

1. *TILLAEA* L.

Small and slender glabrous annuals with opposite leaves. Flowers minute, axillary, white or pinkish. Sepals and petals 3 to 5 (in ours 4), distinct or united at base, the stamens as many. Pistils distinct, with almost obsolete styles. Follicles 4, 1 to several-seeded, the seeds striate longitudinally. (Michael Angelo Tilli, Italian botanist.)

Flowers clustered; petals broadly subulate; follicles 1 to 2-seeded.....1. *T. minima*.
 Flowers solitary; petals oblong; follicles several seeded.....2. *T. drummondii*.

1. *T. minima* Miers. Simple or with several ascending or erect branches, $\frac{1}{2}$ to 3 in. high; herbage of the adult plants reddish; leaves ovate or oblong, obtuse, 1 line long; flowers axillary, subsessile or occasionally on pedicels 1 or 2 lines long; sepals equaling the broadly subulate petals; follicles 1 to 2-seeded.

Common on finely disintegrated sandstone or other rock, from Solano Co. and Sonoma to Berkeley and Marin Co. and southward. Mar.-Apr.

2. *T. drummondii* T. & G. Stems very slender, dichotomous, decumbent and rooting at some of the lower nodes, 1 in. long or more; leaves linear-oblong, acute, 1 to 2 lines long; flowers subsessile; petals oblong, white, 2 to 3 times the length of the calyx-lobes; carpels obtuse.

Moist places in the lower Sacramento Valley. Mar.-May. Var. *BOLANDERI* Wats. Stems 3 in. long; leaves 2 lines long; pedicels elongated in fruit (6 lines long).—San Francisco. May.

2. *SEDUM* L. STONE CROP.

Fleshy glabrous herbs, erect or decumbent, with alternate leaves. Flowers pale yellow or white, in terminal often 1-sided cymes. Calyx divided nearly to the base into 4 or 5 sepals. Petals distinct. Stamens perigynous, the alternate ones usually attached to the petals. Pistils distinct, rarely united at the base, becoming few to many-seeded follicles, diverging when ripe; styles usually short. (From the Latin *sedeo*, to sit, on account of the lowly habit.)

Basal leaves in rosettes; perennial.

Leaves thick, not nerved.....1. *S. spathulifolium*.

Leaves comparatively thin, very obviously nerved when dry.....2. *S. radiatum*.

Leaves all scattered, 1 to 2 lines long; annual.....3. *S. pumilum*.

1. *S. spathulifolium* Hook. Glaucous; leaves flat, obovate or spatulate, obtuse, 5 to 9 lines long, either condensed in small somewhat depressed rosettes which are sessile on the caudex or on its prostrate branches, or sessile on the flowering branches, the latter rather smaller; flowering stems ascending, 4 to 6 in. high; flowers on short pedicels or sessile, 3 lines long, yellow; petals lanceolate, acute, twice longer than the ovate acute sepals, scarcely exceeding the stamens and style.

Common on rocky walls on the north or shady side of cañons: Mt. Diablo; Oakland Hills and northward.

2. *S. radiatum* Wats. Perennial; stems several, simple or branching, from a slender rootstock, 4 to 6 in. high; cauline leaves oblong to oblong-ovate, acute, sessile by a rather broad base, 3 to 5 or 6 lines long, nearly or

quite as long as those of the globose or oblong rosettes at the base of the stem, all when dry delicately but rather conspicuously nerved; sepals short, triangular, acute; petals yellow, narrowly lanceolate, acuminate, 3 lines long; foliicles broad, abruptly divergent from the united bases.

Gabilan Peak; Mt. Hamilton; Marin Co.; Mendocino Co. Rarely collected. Annual, acc. to Greene, and propagating by deciduous buds formed in the axils of the lowest leaves.

3. *S. pumilum* Benth. Annual; branching from just above the base, or sometimes simple, 2 to 4 in. high, very slender; leaves 1 to 2 lines long, ovate-oblong; flowers shortly pediceled or sessile, the branches of the cyme mostly 2 or 3; sepals minute, triangular; petals linear-oblong, acute, 1 to $1\frac{1}{2}$ lines long; foliicles short, filled by the single seed.

Upper Sacramento Valley (Sierra Nevada foothills and the Marysville Buttes); Napa Range, low hills.

3. COTYLEDON L.

Stout perennial herbs; leaves very thick and fleshy, the basal ones in a conspicuous rosette; leaves of the flowering stems mostly bract-like, narrowly lanceolate, or the upper broader and shorter, all commonly with a broad inversely V-shaped clasping base. Flowers large for the group, yellow or reddish, disposed in long racemes or secund cymes. Petals more or less united at base. Foliicles erect or suberect.—In appearance very similar to *Sedum*. (Greek kotule, a shallow cup, the leaves forming a cup.)

Cyme more or less flat-topped; leaves broad.

Petals oblong-ovate or oblong, acute; pedicels 1 or 2 lines long.....1. *C. farinosa*.

Petals oblong-lanceolate or lanceolate, acute; pedicels unequal, 2 to 6 lines long or more.

Petals indistinctly winged on the back; cyme loose, often contorted; plant in age straw-colored2. *C. caespitosa*.

Petals distinctly winged on back; cyme compact; plant reddish.....3. *C. plattiana*.

Cyme with 2 to 4 racemose divisions; pedicels mostly 1 to 2 lines long.

Inflorescence of simple secund racemes.....4. *C. laxa*.

Inflorescence more elongated and paniculately branched.....5. *C. setchellii*.

1. *C. farinosa* Baker. Acaulescent; usually densely mealy, 5 to 8 in. high; leaves oblong-lanceolate, acuminate, the larger ones of the rosette 2 to 3 in. long; cauline leaves bract-like, broadly lanceolate, 1 in. long or less, the upper very short; cyme rather flat and broad, or with several small supplementary branches below and thus disposed to be somewhat paniculate; pedicels 1 or 2 lines long; petals oblong-ovate or oblong, acute, $3\frac{1}{2}$ to 4 lines long.

Pacheco Peak, Brewer. Very closely allied to the next.

2. *C. caespitosa* Haw. Acaulescent, the short caudex $1\frac{1}{2}$ in. thick or less, with reddish flesh; herbage glabrous, the younger leaves in the center of rosette glaucous, the stems and inflorescence disposed to become straw-yellow in age; rosulate leaves 2 to $5\frac{1}{2}$ in. long, either narrowly oblong (6 to 9 lines broad) or strongly dilated above ($1\frac{1}{2}$ in. broad), all with conspicuously acuminate or lanceolate-acuminate apex; cauline leaves narrowly lanceolate and bract-like, $1\frac{1}{2}$ in. long or less, the upper very short and triangular; cyme compound, rather loose and sometimes few-flowered, $1\frac{1}{2}$ to 3 in. high, the whole inflorescence or one side frequently flexuous or recurved-contorted; pedicels 2 to 6 or even 12 lines long; calyx-lobes ovate, acute, nearly 2 lines long; petals orange or yellow, oblong-lanceolate, 4 to 6 lines long, indistinctly winged on the back, fleshy in anthesis, afterwards becoming thin and scarious.

Rocky ridges of the Coast Ranges: Vaca Mts.; Howell Mt. Apr.-June.

Var. *PANICULATA* Jepson. Cymes paniculate, the flowering stems bearing several peduncled cymes from the middle.—Niles, *Jepson*.

3. *C. plattiana* Jepson. Acaulescent, 3 to 8 in. high; leaves more or less glaucous, the whole plant, including the inflorescence, becoming reddish; rosulate leaves 1 to 3 in. long, much like those of the preceding; cyme with numerous flowers, very compact and flat-topped, about $1\frac{1}{2}$ to $2\frac{1}{2}$ in. broad, about $1\frac{1}{4}$ to $1\frac{3}{4}$ in. high; pedicels 2 to 5 lines long; sepals triangular, acute or shortly acuminate, $1\frac{1}{2}$ lines long; petals broadly lanceolate, distinctly winged on the back, 4 lines long.

Inner Coast Range: Mt. Diablo; Vaca Mts.

4. *C. laxa* Brew. & Wats. Nearly acaulescent, very glaucous; flowering branches stout, 1 to 2 ft. high; rosulate leaves lanceolate, sharply acuminate, 3 to 4 in. long or more; inflorescence of 2 to 4 simple secund racemes 3 to 5 in. long; pedicels 1 to 2 (or 3) lines long; sepals ovate, acute, 2 to $2\frac{1}{2}$ lines long; petals orange-yellow in early anthesis, oblong-lanceolate, acute or acuminate, distinctly keeled, 5 to 7 lines long.

Gabilan Range and southward to Southern California.

5. *C. setchellii* Jepson, n. comb. Herbage merely glaucous; flowering branches slender, 9 to 12 in. high; leaves lanceolate or linear-lanceolate and long-acuminate; petals narrowly oblong, acute; racemes many, elongated and paniculate.—(*C. laxa* Brew. & Wats. var. *setchellii* Jepson.)

Coyote Creek, Santa Clara Co.

SAXIFRAGACEAE. SAXIFRAGE FAMILY.

Ours perennial herbs or shrubs with alternate or basal leaves (opposite in *Whipplea*) and no stipules (except in *Ribes*). Flowers perfect, perigynous, usually white, often red, never blue, borne in racemes, panicles or cymes, or solitary. Calyx 5-lobed or -cleft. Petals 5. Stamens in ours definite, 5 or 10 (or sometimes variable in *Whipplea*). Ovary partly or wholly inferior, or superior, 1 to 5-celled, the styles or stigmas as many as the cells or placentae, the latter either parietal or axile. Fruit a capsule, follicle, or berry. Seed with endosperm.

A. Ovary partly inferior or superior; fruit a capsule or follicle.

Leaves alternate or radical; herbs.

Ovary 2 (or 3)-celled with axile placentae, or of 2 or 3 nearly distinct carpels.

Stamens 10 1. *SAXIFRAGA*.

Stamens 5 2. *BOYKINIA*.

Ovary 1-celled.

Styles or stigmas 2 or 3, alternate with the placentae.

Stamens 10, not exerted; petals mostly cleft or toothed; styles 2 or 3, very short...

3. *TELLIMA*.

Stamens 10, exerted, as also the 2 styles; petals inconspicuous, almost filiform....

4. *TIARELLA*.

Stamens 5; styles 2, little exerted; petals entire, small..... 5. *HEUCHERA*.

Stigmas 3 or 4, sessile, opposite the placentae; cluster of united sterile filaments alternate with the stamens, *i. e.*, at the base of the petals; fertile stamens 5; flower

solitary on a scape-like penduncle, showy..... 6. *PARNASSIA*.

Leaves opposite; low trailing shrub; ovary 3 to 5-celled; stamens mostly 10.... 7. *WHIPPLEA*.

B. Ovary wholly inferior; fruit a berry.

Leaves alternate; shrubs; stamens 5 or 4; ovary 1-celled..... 8. *RIBES*.

1. *SAXIFRAGA* L. SAXIFRAGE.

Perennial herbs, the leaves entirely or mainly in a basal cluster. Flowers corymbose-paniculate or solitary. Calyx either free from or cohering with the base of the ovary, 5-cleft or -parted. Petals 5, entire, deciduous. Stamens

10. Styles 2. Capsule 2-beaked, 2-celled, opening down or between the beaks, or sometimes the fruit consists of 2 nearly separate follicles. Seeds numerous. (Latin saxum, a rock, and frango, to break.)

Leaves not cordate, longer than petiole; filaments usually not dilated....1. *S. californica*.
Leaves cordate, the petiole commonly 1 to 3 times as long; filaments dilated toward apex
2. *S. mertensiana*.

1. ***S. californica*** Greene. Acaulescent; pubescent with scattered hairs, those toward summit of scape distinctly gland-tipped; leaves elliptic, rather coarsely serrate, somewhat undulate, $\frac{1}{2}$ to 2 in. long, longer than the broad petiole or nearly sessile; flowers white; lobes of the calyx ovate, reflexed; petals orbicular, often emarginate, $1\frac{1}{2}$ lines long; anthers red, filaments not dilated; ovary half coherent with the calyx, the 2 carpels almost distinct.—(*S. virginensis* Michx. var. *californica* Jepson.)

Mostly in rocky places in the hills: Coast Ranges and Sierra Nevada.

2. ***S. mertensiana*** Bong. Plants 4 to 14 in. high, the scape and leaves from a scaly bulb-like caudex which produces bulblets; petioles and scapes more or less villous, the hairs tipped with red glands; leaves orbicular, cordate at base, crenately toothed, $\frac{3}{4}$ to $3\frac{1}{4}$ in. broad; petioles scarious-dilated at base, 1 to 6 in. long; panicle open, often bearing granule-like bulblets in the axils; bracts lanceolate; flowers white, pendulous after anthesis (the slender pedicels recurved only at the very tip); calyx-tube very short, united to the very base of the ovary, its lobes oblong, reflexed in fruit; petals ovate-oblong, 2 lines long; filaments dilated toward the summit, white and petal-like; carpels almost wholly united.

Woods of the North Coast Ranges: Austin Creek, Sonoma Co.; Mill Creek, near Ukiah; Idol House, Mendocino Co., and far northward. Mar.-May.

S. PELTATA Torr. is a remarkable species of the Sierra Nevada and Yollo Bolly Mts., growing along swiftly flowing mountain streams; it has peltate leaves 1 to 2 ft. in diameter and petioles 1 to $3\frac{1}{2}$ ft. high. *S. BRYOPHORA* Gray, of the high Sierra Nevada, is 4 to 5 in. high, with the scape branching into a very slender panicle; leaves linear-oblong, acute, 3 to 7 lines long; petals 2-spotted toward the base. The two preceding are acaulescent. *S. TOLMIEI* T. & G., of the high Sierra Nevada, has short leafy stems thickly covered with small evergreen sessile leaves, and a few-flowered scape-like peduncle.

2. BOYKINIA Nutt.

Perennial herbs with creeping rootstocks. Stems simple, bearing a few alternate leaves and paniculate or corymbose cymes of white flowers. Calyx-tube turbinate or subglobose or ovate, adherent to the 2-celled ovary; capsule 2-beaked. Petals roundish or elliptic, entire, with a short claw, deciduous. Stamens 5, short. Styles 2. (Dr. Boykin of Georgia.)

1. ***B. elata*** (Nutt.) Greene. Erect, 2 ft. high or less, commonly glandular-pubescent, the bases of the slender stems often clothed with rusty hairs; leaves thin-membranaceous, shallowly lobed or incised and serrate, 2 to 4 in. broad; petioles long, exstipulate, bearing at base some rusty bristles; flowers slightly irregular, borne in a panicle of secund racemes; calyx-lobes lanceolate-triangular; petals narrow.

Woods of the Coast Ranges and Sierra Nevada.

B. MAJOR Gray, of the Sierra Nevada, may be distinguished by its stoutness, conspicuous foliaceous stipules, corymbose-cymose flowers, regular corolla and broad petals.

3. **TELLIMA** R. Br.

Perennial herbs with rootstocks. Stems simple, bearing a simple terminal raceme of white, pink or red flowers. Leaves chiefly radical, their petioles with stipule-like dilations at the base. Calyx campanulate or turbinate; the lower part of the tube adherent to the base or lower half of the ovary. Petals inserted in the sinuses of the calyx, cleft or toothed, sometimes entire. Stamens 10, included. Ovary 1-celled, with 2 or 3 parietal placentae and 2 or 3 very short styles. Capsule conical. Seeds numerous. (Name an anagram of *Mitella*.)

Styles and placentae commonly 3; petals clawed, cleft or entire, usually white, sometimes rose-tinted; rootstocks tuberous or with grain-like bulblets.

Calyx-tube turbinate, the lower half of the ovary adherent.....1. *T. affinis*.
Calyx truncate or rounded at base, the ovary almost wholly free.....2. *T. heterophylla*.
Styles and placentae commonly 2; petals whitish, changing to red, sessile by a broad base, laciniate-pinnatifid; rootstock stout but not tuberous.....3. *T. grandiflora*.

1. ***T. affinis*** (Gray) Boland. "STAR OF BETHLEHEM." Stems 9 to 16 in. high, hispidulous, the hairs spreading and glandular; radical leaves often bronze-brown, roundish in outline and crenately lobed, varying into the cauline; cauline mostly parted into 3 broad divisions which are deeply incised or merely toothed; pedicels about equaling the turbinate calyx; raceme 7 to 10-flowered; petals mostly 3-toothed at apex, the central lobe rather larger; ovary half inferior, the styles and placentae commonly 3, as also in the next.

Common in open ground or open woods: Coast Ranges and Sierra Nevada.

2. ***T. heterophylla*** H. & A. Stems 1 to 2 ft. high; herbage hirsute- or somewhat scabrous-pubescent; radical leaves roundish, crenately lobed, $\frac{1}{2}$ to $1\frac{1}{4}$ in. broad, the cauline very variable but mostly 3-parted with the divisions incised or toothed; calyx campanulate, truncate or rounded at base; petals with a stout tooth on each side.

Shady ground, rather common: Coast Ranges. Var. **BOLANDERI** Jepson. Petals entire or with a small tooth on each side.

3. ***T. grandiflora*** (Pursh) Dougl. FRINGE-CUPS. Stems $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high, hirsute with spreading hairs, as also the petioles; leaves roundish in outline, cordate at base, shallowly 3 to 5-lobed, serrate or crenate, 2 to 4 in. broad, the radical on petioles 2 to 9 in. long; raceme elongated, many-flowered; pedicels shorter than the ($3\frac{1}{2}$ lines long) flowers; calyx 10-nerved, inflated-campanulate, 4 to 5 lines long, its teeth erect; petals reflexed, at first whitish, changing to deep red, the upper portion laciniately cleft into subulate segments, the lower portion toothed; filaments scarcely as long as the anthers; ovary almost completely inferior, with 2 parietal placentae alternate with as many styles.

Coast Range woods from Santa Cruz, San Francisco and Oakland Hills northward. One of the plants which follows very closely the distribution of the Redwood. Apr.-May.

4. **TIARELLA** L. FALSE MITRE-WORT.

Perennial herbs with white flowers in a terminal raceme or panicle. Calyx almost free from the ovary, its lobes ovate. Petals very narrow, with short claws. Stamens 10, long and slender. Ovary 1-celled, compressed, 2-horned, the horns tapering into the long filiform styles. Capsule membranous, early dehiscent; valves unequal, one becoming elongated, the other remaining short. Seeds few at the base of each parietal placenta. (Diminutive of the Greek tiara, a high cap, in allusion to the pistil.)

1. *T. unifoliata* Hook. Stems sparingly leafy, usually several from the base, $\frac{3}{4}$ to 2 ft. high; leaves roundish or somewhat ovate in outline, 3 to 5-lobed, cordate at base, $1\frac{1}{2}$ to 4 in. broad, the lobes crenate; cauline leaves 2 or 3; radical leaves long-petioled (3 to 9 in.); panicle 3 to 9 in. long; petals linear-subulate or almost filiform, inconspicuous; calyx adherent only to very base of ovary, its lobes minutely ciliate.

Shady cañons and woods, only near the coast from the Santa Cruz Mts. northward.

5. HEUCHERA L. ALUM ROOT.

Perennial herbs with stout rootstocks. Leaves radical, rounded, cordate and lobed. Flowering stems scape-like, or with 1 to 3 leaves, bearing an open or condensed panicle of small flowers in cymose clusters. Calyx campanulate or somewhat turbinate, its tube adnate to the lower $\frac{1}{2}$ of the ovary. Petals 5, very small or wanting, when present inserted on the throat of the calyx, clawed and entire. Stamens 5, ours with slender filaments. Capsule 1-celled with 2 parietal placentae, dehiscent between the 2 beaks. (J. H. Heucher, 1677-1747, German Professor of Medicine.)

Cymes loose, the pedicels longer than the flowers; calyx turbinate at base.....

1. *H. micrantha*.

Cymes close, the pedicels shorter than the flowers; calyx rounded at base.....

2. *H. pilosissima*.

1. *H. micrantha* Dougl. Flowering stems 1 to 3 ft. high; petioles and stems pilose-hirsute, the leaves hirsutulous and the inflorescence glandular-puberulent; leaves round- or ovate-cordate, 2 to 4 in. long, obtusely lobed and crenate-toothed, on petioles as much as 10 in. long; flowers in an ample loose panicle; calyx 1 line long, shorter than the slender pedicels; petals narrowly oblong, curving, rather shorter than the calyx.

Coast Ranges, common toward the coast, not reported from inner Coast Range; Sierra Nevada.

2. *H. pilosissima* F. & M. Very glandular villous, 1 to 2 ft. high; pedicels shorter than the flowers, these in close clusters and panicle less ample than in the preceding; calyx globular, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

Near the coast, Monterey to Humboldt Co. Perhaps too near preceding.

H. RUBESCENS Torr. Leaves mostly 1 in. broad or less; calyx oblong-campanulate, tinged with rose-purple.—Sierra Nevada.

6. PARNASSIA L. GRASS OF PARNASSUS.

Glabrous perennial herbs with entire leaves in a radical tuft. Flowers solitary, white, on scape-like stems, which commonly bear a single small sessile leaf. Sepals slightly united at base. Petals greenish- or yellowish-veined, each bearing at base a cluster of gland-tipped sterile filaments. Stamens 5, alternate with the petals. Ovary 1-celled; stigmas 4 (or 3), sessile, opposite the same number of placentae. Capsule 3 or 4-valved, the valves placenta-bearing along their middle. Seed-coat loose, somewhat winged. (Called Grass of Parnassus by Dioscorides, from Mt. Parnassus.)

1. *P. palustris* L. var. *californica* Gray. Scape 9 to 14 in. high; leaves elliptic, 1 to $1\frac{1}{2}$ in. long, contracted at base into a petiole which is short or twice as long as the blade; petals oval or obovate, 6 to 9 lines long; sterile filaments capillary, 20 to 24 in a set, united to the middle, each tipped with an antheroid protuberance.—(*P. californica* Greene.)

Rare in the Coast Ranges: Loma Prieta; Marin Co. (cf. *Erythea*, vii, 84.) More common in the Sierra Nevada.

PHILADELPHUS LEWISII Pursh var. *CALIFORNICUS* Gray. Deciduous loosely branching shrub 4 to 6 ft. high; leaves opposite; petals 4 or 5, large, white; stamens 20 to 40; styles 3 to 5, distinct at apex; ovary wholly inferior, 3 to 5-celled, loculicidally 3 to 5-valved.—Sierra Nevada foothills and up to 4000 ft., along streams; showy when in flower.

MITELLA BREWERI Gray. Small, with round-cordate radical leaves; calyx saucer-shaped; petals greenish, pinnately cleft into capillary divisions; stamens 5, inflexed.—High Sierra Nevada.

7. *WHIPPLEA* Torr.

Small low under-shrub with opposite leaves and clusters of small white flowers on a terminal naked peduncle. Calyx-tube wholly adnate to the lower portion of the ovary which is about $\frac{2}{3}$ free. Stamens 10, rarely 8, 9, 11 or 12, those opposite the petals somewhat shorter, all dilated at the base or below the middle. Ovary 3 to 5-celled, with a single suspended ovule in each cell; styles distinct, subulate; stigmas introrse. Capsule septicidally dehiscent into 3 to 5 cartilaginous 1-seeded portions which open down the ventral suture. (Lieutenant A. W. Whipple, commander of the Pacific Railroad Expedition from the Mississippi River to Los Angeles in 1853 and 1854.)

1. *W. modesta* Torr. Stems slender, diffuse or trailing; branchlets, peduncles and calyx-tube pubescent; calyx-lobes glabrous; foliage with scattered hairs, on the older leaves often pustulate-dilated at base; leaves $\frac{3}{4}$ to $1\frac{1}{4}$ or rarely $1\frac{3}{4}$ in. long, ovate or oval-ovate, 3-nerved from the base, crenate above the middle, short-petioled; clusters mostly 4 to 9-flowered, the flowers soon becoming somewhat greenish; petals oblong or ovate, contracted at base, exceeding 1 line, larger than the linear calyx-lobes; capsule globular; styles deciduous.

Woods and thickets of the Coast Ranges from Monterey northward to Humboldt Co. and east to Mt. St. Helena and the Vaca Mts. Mar.-Apr.

8. *RIBES* L. GOOSEBERRY. CURRANT.

Shrubs, either unarmed or prickly. Leaves alternate, palmately lobed, the stipules adnate or none. Flowers in racemes or solitary, the pedicels bracteolate. Calyx-lobes, petals and stamens 5 in all ours except *R. speciosum*. Calyx-tube adnate to the 1-celled ovary and more or less produced beyond it. Petals inserted on the throat of the calyx, the stamens alternating with them. Placentae 2, parietal. Styles 2, distinct or more or less united; stigma terminal. Fruit a berry. (Ancient Arabic name.)

Thornless and without prickles; raceme many-flowered (except no. 1); berry unarmed, rarely glandular-bristly.—CURRANTS.

Leaves convolute in the bud; flowers bright yellow; calyx-tube salverform..... 1. *R. aureum*.

Leaves plaited in the bud; flowers rose-red varying to white.

Leaves thin, glabrous or nearly so..... 2. *R. sanguineum*.

Leaves thick, very rugulose, more or less white-tomentose beneath.. 3. *R. malvaceum*.

Thorny and often prickly; leaves plaited in the bud; raceme 1 to 4-flowered.—GOOSEBERRIES.

Petals plane, fan-shaped; anthers obtuse and pointless; styles long-villous; berry glabrous

..... 4. *R. divaricatum*.

Petals involute; anthers sagittate, mucronate-tipped; styles glabrous; berry prickly.

Calyx greenish white..... 5. *R. victoris*.

Calyx greenish, glabrous exteriorly; soft bristles of the ovary non-glandular.....

..... 6. *R. californicum*.

Calyx purplish, glandular-pubescent exteriorly; hairs of the ovary capitate-glandular..

..... 7. *R. menziesii*.

1. *R. aureum* Pursh var. *tenuiflorum* Torr. Shrub 4 to 8 ft. high, nearly glabrous, not glandular; leaves 3 to 5-lobed, obtuse or truncate at base, the

lobes few-toothed or incised; racemes about 1 in. long, loose, with few to several flowers, the bracts foliaceous and conspicuous; flowers golden yellow; calyx-tube salverform, 3 to 4 times the length of the oval lobes; berry yellowish, 2 lines long.

Banks of streams, Coast Ranges and Sierra Nevada.

2. *R. sanguineum* Pursh var. *glutinosum* Brew. & Wats. FLOWERING CURRANT. Erect or spreading shrub, 5 to 8 or 9 ft. high; bark brownish, shreddy; herbage glandular; leaves thin, orbicular-cordate in outline, 1 to 1½ in. broad, the lobes shallow and rather finely serrate; petioles 1 to 1½ in. long; racemes 1 to 2 in. long, the bracts colored; flowers rose-color, 5 lines long; pedicels 3 lines long, with 2 bractlets at apex; calyx reddish, the lobes elliptic, spreading; petals obovate, 1½ lines long, white, changing to deep red; stamens and style not surpassing the petals; berry blue-black, with bloom, 4 lines in diameter.

Common in cañons or on northward slopes near the coast. Jan.-Mar.

3. *R. malvaceum* Smith. Similar to the preceding but with stouter branches and commonly more strictly erect and compact, 4 to 6 ft. high; leaves thick, conspicuously rugulose, slightly scabrous above, more or less white-tomentose beneath; flowers rose-color or very pale pink; berry glaucous, somewhat hispidulous or hairy, the pulp soft and sweet.

Open hills of the Coast Ranges about San Francisco Bay: Berkeley; Vaca Mts. Dec.-Jan.

4. *R. divaricatum* Dougl. STRAGGLY GOOSEBERRY. Shrub 4 to 6 ft. high, with long straggling branches; bark dull gray; herbage glandular when young; subaxillary spines most often 1, sometimes 3; leaves roundish, palmately 3 to 5-cleft, the divisions incised or crenately toothed; petioles shorter or longer than the blades; racemes drooping; pedicels slender, ½ in. long, with a small roundish bract at base; flowers 5 lines long; sepals broadly oblong, obtuse, 2 lines long, green without, dull purple within; petals white, fan-shaped, plane, less than 1 line long; stamens and style long-exserted, the latter deeply cleft, long-villous at the middle.

Shaded cañons and flats, mostly near the coast: San Francisco; Oakland Hills; Marin Co.; Mendocino Co.; southward to Southern California and northward to British Columbia.

5. *R. victoris* Greene. VICTOR'S GOOSEBERRY. Low bush, 1½ to 2 ft. high, the branches of the season or preceding season with soft prickles and weak spines, the older branches unarmed and with gray-brown bark; young herbage hirsutulous and very viscid-glandular; leaves ½ to ¾ in. long, crenately incised, distinctly 5-lobed, the lower pair of lobes much smaller; flowers 8 lines long, on long (1 to 1¼ in.) slender pedicels which bear an ovate bract 1 line long close below the flower, or the bracts 2 and the flowers as many; sepals dull white; petals clear white, similar to no. 7; filaments stoutish, much surpassing the petals; fruit golden yellow, 7 or 8 lines in diameter, densely covered with slender prickles.

Marin and Sonoma cos. eastward to the Vaca Mts.

6. *R. californicum* H. & A. HILLSIDE GOOSEBERRY. Compact shrub, with more or less flexuous branches, 2½ to 4 ft. high; leaves at flowering time mostly ¼ to ¾ in. broad, the entire upper surface glandular-shining; flowers solitary (sometimes 2), 5 lines long; pedicels with a couple of shallowly lobed bracts at middle; calyx greenish, purplish-tinged, glabrous; petals white,

convolute as in no. 7; ovary covered with soft bristles interspersed with short gland-tipped hairs.

Dry exposed slopes of hills in the San Francisco Bay region. Distinguished from the next by the soft non-glandular bristles of the ovary.

7. *R. menziesii* Pursh. CANON GOOSEBERRY. Tall openly branched shrub, 4 to 8 ft. high; stems with mostly 3 strong spines at the nodes and also more or less prickly, especially on the sterile shoots; pedicels 1 or 2-flowered, the bractlet rather near the flower; flowers $\frac{1}{2}$ in. long; exterior of calyx more or less glandular-pubescent, its lobes lurid-purple, 3 lines long, closely reflexed; petals white, waxy, involute from each edge, truncate and often minutely crenulate-toothed at apex, 2 lines long, the stamens nearly twice as long; style exceeding the stamens, 2-cleft at apex; ovary covered with short hairs, the hairs capitate-glandular.

Cañons and brushy slopes in the outer Coast Ranges of middle California. Jan.-Feb.

R. SPECIOSUM Pursh. Tall thorny nearly evergreen shrub; leaves dark green, small, coriaceous; flowers 5 or 4-merous, bright red, drooping; corolla 6 to 8 lines long, the stamens $\frac{3}{4}$ to 1 in. long, long-exserted; calyx-lobes erect.—Monterey to San Diego.

ROSACEAE ROSE FAMILY.

Herbs, shrubs or trees. Leaves alternate, toothed or divided, ours with stipules, commonly petioled. Flowers regular, commonly perfect, solitary or in spikes, racemes, corymbs, panicles or cymes. Calyx 5 (or 4)-lobed. Petals 5, rarely none. Stamens 10 to numerous, usually indefinite, inserted with the petals on the calyx below its lobes. Pistils 1 to many, distinct and free from the calyx, or united into a 2 to 5-celled ovary which is nearly or completely inferior. Fruit a follicle, an achene, a drupe, a cluster of drupelets (as in a blackberry), or a pome. Seeds with straight embryo; endosperm usually none. Calyx in certain genera appearing double by a row of bractlets borne at or near the sinuses.

A. Ovary superior.

1. Fruit dehiscent, consisting of 2 to 5 follicles; shrubs with simple leaves.—SPIREAE (Meadow Sweet Tribe.)

Follicles dehiscent by both sutures, several-seeded; flowers in corymbs...1. PHYSCARPUS.
Follicles dehiscent by the dorsal suture or indehiscent, 1-seeded; flowers in panicles.....2. HOLODISCUS.

2. Fruit indehiscent, consisting of 1 to many achenes or composed of drupelets and styled a "berry."—ROSEAE (Rose Tribe).

a. Shrubs.

Leaves simple; pistil 1, becoming an achene.

Petals white; leaves linear and rigid; achene not tailed.....3. ADENOSTOMA.

Petals none; leaves broadly obovate; achene with long plumose tail..4. CEROCARPUS.
Leaves pinnately compound; pistils many, disposed on the inside of a globose or urn-shaped calyx-tube which is lined by the receptacle and in fruit termed a "hip;" stems prickly..5. ROSA.

Leaves simple or compound; pistils many on a convex receptacle, becoming drupelets which are coherent and form the fruit called a "berry".....6. RUBUS.

b. Herbs.

Perennials.

Pistils many on a convex receptacle, becoming achenes; calyx with a row of bractlets alternating with the sepals.

Receptacle fleshy; leaves 3-foliolate.....7. FRAGARIA.

Receptacle dry; leaves digitate or pinnate.....8. POTENTILLA.

Pistil 1; leaves pinnate.

Petals yellow; prickles of calyx hooked at tip.....9. AGRIMONIA.

Petals none; prickles of calyx straight, but retrorsely barbed.....10. ACAENA.

- Annuals; diminutive plants, with palmately divided leaves; petals none; pistil (in ours) 1, becoming an achene.....11. *ALCHEMILLA*.
 3. *Trees or shrubs with simple leaves and early-falling stipules; fruit a drupe.*—*DRUPEAE* (*Cherry Tribe.*)
 Flowers dioecious; pistils 5; drupes 1 to 4.....12. *OSMARONIA*.
 Flowers perfect; pistil 1; drupe solitary.....13. *PRUNUS*.

B. Ovary inferior.

- Trees and shrubs with simple leaves and free stipules; fruit a pome, consisting of a 2 to 5-celled ovary which is enclosed in and mostly adherent to the fleshy calyx-tube.—*POMEAE* (*Apple Tribe.*)
 Leaves evergreen, coriaceous; flowers small, numerous in a corymbose panicle; fruit bright red, the 2 carpels enclosed in the berry-like calyx.....14. *HETEROMELES*.
 Leaves deciduous.
 Flowers in corymbs; ovary 2 to 5-celled.
 Pome drupe-like, containing 2 to 5 bony stones, either separable or united into one; branches bearing thorns.....15. *CRATAEGUS*.
 Pome containing 2 to 5 papery or cartilaginous carpels, each 2-seeded...16. *PYRUS*.
 Flowers in racemes, showy; ovary 5-celled, each cell in fruit becoming 2-celled by a partition from the back.....17. *AMELANCHIER*.

1. *PHYSOCARPUS* Maxim. *NINE BARK.*

Diffuse shrubs with reddish brown shreddy bark. Leaves simple; stipules deciduous. Flowers white, in corymbs terminating lateral leafy branchlets. Calyx campanulate, 5-cleft, persistent. Petals 5, rounded, equal. Stamens 20 to 24. Pistils 1 to 5, mostly 3, somewhat united toward the base, becoming as many inflated 2 to 4-seeded follicles dehiscent along both sutures. Seeds crustaceous, shining, with copious endosperm.—(Greek *phusa*, bellows or bladder, and *karpós*, fruit.)

1. *P. capitatus* (Pursh) Ktze. Erect or straggly shrub 3 to 5 ft. high; leaves roundish or ovate, 3-lobed and irregularly serrate, glabrous or scabrous above, stellate-pubescent beneath, 1 to 2 in. long, on petioles $\frac{1}{2}$ in. long or more; leaves of sterile shoots similar but larger; pedicels and calyx pubescent; corymbs hemispherical, $\frac{3}{4}$ to 1 in. high; petals $1\frac{1}{2}$ lines long; stamens alternately long and short; pods divergent, commonly 3 to 4 lines long, splitting into 2 valves.—(*Neillia opulifolia* var. *mollis* of Bot. Cal. *Opulaster opulifolia* var. *capitatus* Jepson.)

Common along streams or often gregarious on steep north slopes: Coast Ranges (not reported from inner range); Sierra Nevada.

2. *HOLODISCUS* Maxim.

Deciduous shrubs with toothed or lobed leaves and no stipules. Flowers creamy-white, small, numerous in terminal panicles. Calyx persistent, 5-cleft. Petals 5, rounded. Stamens 20, on a ring-like perigynous disk. Pistils 5, distinct, alternate with the calyx-lobes. Follicles hairy, 1-seeded, tardily dehiscent or indehiscent. (Greek *holo*, whole or complete, and *diskos*, a disk.)

1. *H. discolor* (Pursh) Maxim. var. *ariaefolius* (Wats.) Jepson. CALIFORNIA MEADOW SWEET. Spreading shrub 3 to 6 ft. high; leaves ovate to ovate-elliptic in outline, green above, whitish beneath with soft hairs, coarsely serrate or incised above the entire truncate or broadly cuneate base, $\frac{3}{4}$ to 3 in. long, on petioles 2 to 6 lines long; panicle ample, 3 to 8 in. long, often half drooping in anthesis; flowers $1\frac{1}{2}$ lines long; follicles about 1 line long.

Cañons and low hills of the Coast Ranges from the coast to the inner ranges. Var. *DEMOSEUS* Abrams. Lower and more compact; panicle less diffuse.—Sierra Nevada.

3. **ADENOSTOMA** H. & A.

Evergreen shrubs with somewhat resinous herbage and heath-like foliage. Leaves linear, rigid, entire, small, numerous and mostly fascicled. Flowers small, white, disposed in a terminal and rather close pyramidal panicle, the branches of which are racemose. Calyx obconical, 5-lobed, 10-ribbed, with small bracts at base, the orifice bearing 5 glands. Petals 5. Stamens 10 to 15, inserted 2 or 3 together, alternate with the petals. Pistil 1, simple; ovary obovoid, 1-celled; ovules 1 or 2, suspended; style lateral, curved, with an obliquely dilated stigma. Fruit an achene, covered by the indurated calyx-tube. (Greek *aden*, gland, and *stoma*, mouth, in allusion to the calyx.)

1. **A. fasciculatum** H. & A. CHAMISE. Spreading bush 2 to 10 ft. high, with virgate branches clothed with leaf-fascicles; leaves linear or rather broader towards the apex, 3 to 5 lines long; stipules small, acute; flowers crowded, sessile; calyx 1 line long; petals orbicular, spreading.

The most abundant and characteristic bush of the higher Coast Ranges and Sierra Nevada, commonly gregarious and occupying (to the exclusion of other shrubs) extensive and especially abrupt slopes and mountain ridges, such vegetation known to mountaineers as "Chamise" or "Greasewood." It often forms a distinct zone between the foothills and the Yellow Pine belt. June.

CHAMAEBATIA FOLIOLOSA Benth. Mountain Misery. Odorous low shrub 1 or 2 ft. high, glandular-pubescent throughout; leaves thrice pinnate with numerous minute leaflets; cymes few-flowered; petals white, 3 to 4 lines long.—Abundant in the lower part of the Yellow Pine belt in the Sierra Nevada, often covering extensive tracts. Also called Bear-mat, Bear-clover and Tarweed.

4. **CERCOCARPUS** HBK.

Deciduous shrubs or low trees with spur-like branchlets and simple coriaceous straight-veined leaves. Flowers from winter buds, solitary or fascicled, terminal on the short branchlets. Calyx consisting of a slender pedicel-like tube abruptly expanded into the low-hemispherical deciduous 5-toothed limb. Petals none. Stamens numerous, borne in two or three rows on the calyx. Pistil 1, with a 1-celled ovary, 1 ovule, and a single long style and terminal stigma. Fruit a villous achene enclosed in the persistent calyx-tube and surmounted by the very much elongated twisted soft-hairy style. (Greek *kerkis*, a shuttle, and *karpós*, fruit, in reference to the achene and its twisted tail.)

1. **C. parvifolius** Nutt. HARD TACK. Spreading shrub 5 to 8 ft. high; leaves obovate, serrate above the middle, cuneate and entire towards the base, not resinous; clusters 2 to 3-flowered.—(*C. betulaeifolius* Nutt.)

Common chaparral shrub throughout the Coast Ranges and Sierra Nevada. Often called Sweet Brush and also Mountain Mahogany, the wood very hard.

C. LEDIFOLIUS Nutt. Mountain Mahogany. Leaves narrowly lanceolate, acute at both ends, entire with revolute margins, glabrate and lustrous above, somewhat resinous, $\frac{1}{2}$ to 1 in. long; flowers solitary or rarely in 2s.—Sierra Nevada, mostly east slope; Shasta Valley; Southern California.

5. **ROSA** L. ROSE.

Shrubby prickly plants with odd-pinnate leaves and adnate stipules. Flowers large, ours mostly pink, solitary or corymbose. Calyx-tube globose or urn-shaped, becoming fleshy in fruit; calyx-limb 5-parted. Bractlets none. Petals

5 (rarely 6, 7 or 8), rounded, spreading, inserted with the numerous stamens on the edge of the thin disk which lines the calyx-tube within and bears toward the base the numerous distinct pistils. Ovaries hairy, becoming bony achenes. Achenes enclosed in the globose or urn-shaped calyx-tube, which is popularly termed a "hip." (The Latin name.)

Flowers solitary, or 2 or 3 in a cluster; calyx-lobes deciduous from the fruit.....

1. *R. gymnocarpa*.

Flowers few to many in a corymb; calyx-lobes persistent in fruit.

Calyx-lobes soft-pubescent outside; plants 3 to 5 ft. high or more.....2. *R. californica*.

Calyx-lobes glandular-hispid outside; plants $\frac{3}{4}$ to 1 ft. high.....3. *R. spithamea*.

1. ***R. gymnocarpa* Nutt. WOOD ROSE.** Slender, 1 to 3 ft. high, glabrous, the branchlets and rachis of the leaves armed with long slender straight prickles, or sometimes nearly unarmed; leaves 2 or 3 in. long; leaflets 5 or 3, 7, 9, 11, elliptic or roundish, 3 to 9 lines long, doubly serrate, the minute teeth gland-tipped; flowers generally solitary or in clusters of 2 or 3; corolla 7 to 10 lines broad; pedicels glabrous or more frequently clothed with gland-tipped hairs; calyx-lobes at length deciduous; hips ovate or pear-shaped, red, 4 to 7 lines long.

Shady woods or bushy north slopes, often near streams, Coast Ranges and Sierra Nevada.

2. ***R. californica* C. & S. CALIFORNIA WILD ROSE.** Erect branching shrub 3 to 6 ft. high; prickles few, stout, recurved, mostly in pairs below the leaves; leaves pubescent, especially on the lower surface; leaflets 5 or commonly 7, ovate to elliptic, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; flowers in terminal corymbs, 1 to $1\frac{1}{4}$ in. broad; pedicels glandular-pubescent; hips globose, 4 to 6 lines broad, somewhat constricted below the calyx-lobes.

Common everywhere along river and creek banks at the lower and middle altitudes throughout California, often forming small thickets. Flowering most freely in June, the hips ripe Aug.-Oct.

3. ***R. spithamea* Wats. var. *sonomensis* Jepson. SONOMA ROSE.** Branches several from the base, erect, mostly simple, 9 to 12 in. high, densely armed with stout straight or slightly recurved prickles; leaflets 5, broadly ovate, 4 to 8 lines long, serrate, with the teeth minutely glandular-denticulate; flowers small, several in a corymb; hips globose, 3 to 5 lines broad; calyx-lobes ovate-lanceolate, glandular-hispid, rather closely erect in fruit.

Rare montane species, on high dry slopes: Sonoma Co., *Greene*; Mt. Tamalpais, *Jepson*; Saratoga, Santa Clara Co., *Davy*.

6. RUBUS L.

Ours bushes, prickly or unarmed, the stems erect, or long and trailing or climbing. Leaves simple, or pinnately compound with 3 to 5 leaflets. Calyx 5-parted, without bractlets. Petals 5. Stamens numerous. Pistils many, crowded on an elevated receptacle, becoming drupelets which are united to each other and form the aggregate fruit called a blackberry or raspberry. (Latin name, allied to *ruber*, red.)

Fruit conical or hemispherical, concave beneath, the drupelets parting from the receptacle as a whole when ripe.

Stems unarmed; leaves simple, palmately lobed.....1. *R. parviflorus*.

Stems prickly; leaflets 3-foliolate

Flowers red; leaves pubescent or silky beneath.....2. *R. spectabilis*.

Flowers white; leaves white-tomentose beneath.....3. *R. leucodermis*.

Fruit oblong, the drupelets persistent upon the receptacle; leaves mostly 3 to 5-foliolate, a few simple; stems and leaves very prickly.....4. *R. vitifolius*.

1. ***R. parviflorus* Nutt. THIMBLE BERRY.** Erect, 3 to 6 ft. high; bark

eventually shreddy; leaves palmately 5-lobed, cordate at base, circular in outline, 3 to 7 in. broad, mucronate-serrate, soft pubescent, the veins beneath as well as the petioles and stems hispid and more or less glandular; stipules lanceolate, deciduous; flowers about 4 to 7 in terminal corymbs, white (rarely pinkish), 1 to 3 in. broad, very variable in the number of sepals and petals; calyx-lobes ovate, terminated by a tail-like or sometimes foliaceous appendage often of nearly the same length; petals elliptic.—(*R. nutkanus* var. *velutinus* Brewer.)

Common along cañon streams in the hill country near the coast, and in the Sierra Nevada (3000 to 7000 ft.). May-July.

2. *R. spectabilis* Pursh var. *menziesii* Wats. SALMON BERRY. Stems erect, 3 to 9 ft. high, with reddish brown bark and sparingly armed, or the canes (sterile shoots) very prickly; prickles short, straight; leaves 3-foliolate; leaflets ovate, doubly serrate, often more or less lobed, 1 to 2 in. long, lightly pubescent or silky beneath; flowers 1 to 3 in a cluster; petals red, 6 to 7 lines long; fruit large, ovoid, red or yellow, glabrous.

Margins of woods and along streams, vicinity of the ocean: San Francisco; Pt. Reyes; Mendocino Co. and northward.

3. *R. leucodermis* Dougl. RASPBERRY. First year stems vigorous and erect ("canes"), bearing 5 to 7-foliolate leaves, the second year bearing short leafy flowering branchlets with 3-foliolate leaves, bending over and becoming straggling; stems and petioles armed with short recurved prickles; herbage glaucous; leaflets ovate to ovate-lanceolate, often unequal-sided at base, doubly serrate, $\frac{3}{4}$ to 2 in. long, pubescent but green above, white with a dense close tomentum below; stipules setaceous; flowers few, corymbose, white, 6 lines broad; sepals lanceolate, long-acuminate, exceeding the petals; fruit glaucous, of an agreeable flavor, either black or red.

Coast Ranges, near the coast and rather uncommon within our limits: Santa Cruz Mts.; Sonoma and Mendocino cos. and northward. Sierra Nevada.

4. *R. vitifolius* C. & S. COMMON BLACKBERRY. Evergreen bush; stems a few ft. high and more or less erect, or several to 18 ft. long and trailing over the ground or climbing over other shrubs; leaves pubescent or almost glabrous, pinnately 3 to 5-foliolate, the leaflets ovate, doubly serrate, $\frac{3}{4}$ to 2½ in. long, or sometimes a few upper leaves simple and ovate or palmately lobed; petals 8 or 9 lines long; fruit black, oblong, sweet.—(*R. ursinus* C. & S.)

Valleys and hills, chiefly along streams or in springy flats: Bay region and Great Valley, south to Southern California and north to British Columbia.

7. FRAGARIA L. STRAWBERRY.

Perennial acaulescent herbs propagating by runners. Leaves tufted, 3-foliolate, with membranous stipules and cuneate-obovate serrate leaflets. Flowers white, borne in cymes on a naked scape. Calyx persistent, bearing 5 bractlets alternate with the calyx-lobes. Petals obovate, short-clawed. Pistils numerous, distinct, borne on an elevated convex receptacle; styles lateral. Fruit berry-like, formed of the enlarged succulent receptacle which bears the minute seed-like achenes. (Name in reference to the fragrance of the berry.)

Leaves thin, light green; achenes borne on the surface of the receptacle..1. *F. californica*.
Leaves thicker, dark green; achenes partly imbedded in the surface of the receptacle..

2. *F. chilensis*.

1. *F. californica* C. & S. WOOD STRAWBERRY. Scares 4 or 5 in. high, cymosely 2-flowered; herbage pilose; leaflets thin, light green, 1 to 1½ in.

long; sepals and bractlets laciniately 2 or 3-toothed or entire; petals orbicular with a small abruptly acute point at apex, or the margin near the apex slightly crimped, 3 to 4 lines long; fruit globose, about 4 lines in diameter, the achenes borne superficially.

Openly wooded hills: Napa Valley to Berkeley and Mt. Diablo, and southward to Southern California.

2. *F. chilensis* Duch. SAND STRAWBERRY. Runners slender or rather stout; upper surface of leaves glabrous, the herbage otherwise densely pubescent with long weak hairs (especially the under surface of the leaves) and often, also, with a fine indument; leaves of firm texture, dark green, the leaflets $\frac{1}{2}$ to 1 in. long; scapes several-flowered, 1 to 4 in. high; flowers 1 in. in diameter; sepals entire; petals roundish, 4 to 6 lines long; receptacle with the achenes embedded in its surface.

Sand-dunes and beaches along the sea-coast, San Francisco north to British Columbia.

8. POTENTILLA L. FIVE FINGER.

Perennial herbs (or some species of the Sierra Nevada suffrutescent), with compound leaves and serrate or cleft leaflets. Flowers in ours white or yellow, in terminal cymes. Calyx saucer-shaped, campanulate, or cup-shaped, cleft into 5 lobes, with as many alternate bractlets at the sinuses. Petals orbicular to linear. Stamens 10 to many, the filaments filiform or variously dilated. Pistils many or numerous, borne upon an elevated receptacle, becoming in fruit small turgid crustaceous achenes; styles lateral or nearly terminal, deciduous. (Diminutive of the Latin *potens*, powerful, some species used medicinally.)

Stamens 10 to many; filaments filiform; petals yellow, obovate, not clawed.

Stamens 10 (?); leaves palmately 3-foliolate; stems erect or ascending.....1. *P. millegrana*.

Stamens 20 to 25; leaves pinnate,

Leaves white-silky beneath; creeping herb.....2. *P. anserina*.

Leaves green on both faces; stems erect.....3. *P. glandulosa*.

Stamens 10 in 2 rows, alternately long and short; filaments dilated throughout or at base only; petals white, obovate or linear, often clawed.

Cymes disposed to be lax; bractlets mostly as large as the calyx-lobes.

Herbage glandular-pubescent and green; bractlets entire or toothed.

Calyx short-campanulate; leaflets sharply toothed or sparingly incised; stems slender..

4. *P. multijuga*.

Calyx cup-shaped.

Leaflets toothed or incised at apex; stems stout.....5. *P. californica*.

Leaflets incisely once or twice cleft; stems slender.....6. *P. elata*.

Herbage white-silky, glandless; bractlets entire.....7. *P. kelloggii*.

Cymes more condensed; bractlets smaller than the calyx-lobes; stems sparingly leafy, the leaves mostly in a radical tuft.

Lobes of the leaflets obtuse; petals notched at apex.....8. *P. tenuiloba*.

Teeth or short lobes of the leaflets acute; petals entire.....9. *P. bolanderi*.

1. *P. millegrana* Engelm. Stems erect or ascending, leafy up to the inflorescence; leaves ternately 3-foliolate, the lower on long slender petioles; leaflets cuneate-obovate or roundish, serrate towards the apex, about $\frac{1}{2}$ in. long; stipules ovate-lanceolate, entire; flowers very numerous in lax cymes; stamens about 10; achenes white.—(*P. rivalis* var. *millegrana* Wats.)

Lower San Joaquin River.

2. *P. anserina* L. GOOSE-GRASS. SILVER-WEED. Root bearing a tuft of leaves, stems and peduncles; stems slender, prostrate, rooting at each joint; flowers one to several, long-peduncled; leaves white-silky beneath, green above; leaflets 7 to 21, with smaller ones interposed, oblong, sharply serrate; bractlets about equaling the calyx-lobes; petals rounded, much exceeding the calyx; stamens 20 to 25; receptacle hairy.

Marshy or springy places along the sea-coast, San Francisco and northward. Sierra Nevada.

3. *P. glandulosa* Lindl. Erect, 1 to 3 ft. high, glandular-pubescent above; radical leaves 4 to 8 or even 15 in. long; leaflets 5 or 7 (or those of the uppermost leaves 3), broadly ovate or obovate with cuneate base, 1 to 3 in. long; cyme lax, leafy-bracted; flowers small, the pale yellow obovoid petals scarcely equaling the calyx; stamens 25, in one row on the margin of the thickened disk; style attached below the middle of the ovary.

Wooded hills of the Coast Ranges and north to Washington. Apr.-May. The var. *NEVADENSIS* Wats. is the Sierra Nevada form; leaflets small; inflorescence more naked.

4. *P. multijuga* Lehm. Stems erect, 1 ft. high, the leaves mostly at base; herbage glandular; leaflets 17 to 23, or the terminal ones more or less confluent, roundish to cuneate-obovate, sharply toothed except at the very base, 5 to 6 lines long; calyx short-campanulate, the bractlets entire, smaller than the lobes; petals narrowly oblong, white, spreading; filaments subulate-dilated, the alternate little shorter.

Monterey to Santa Barbara; also Ballona (acc. to Abrams).

5. *P. californica* (C. & S.) Greene. Stems stoutish, 1 to 2 ft. high; herbage glandular-pubescent; leaves mostly radical; leaflets thickish, 9 to 21 (or the upper leaves with fewer leaflets), cuneate-obovate to oblong, toothed or incised at the apex, $\frac{1}{2}$ to 1 in. or less long; flowers solitary, or commonly in dense clusters in a cymose-dichotomous inflorescence; calyx cup-shaped, 4 to 6 lines high, about equaling the spatulate petals; bractlets exceeding the sepals, sometimes 3-toothed at the broad apex.—(*Horkelia californica* C. & S.)

Wooded slopes of the San Francisco Peninsula and the Oakland Hills. Var. *CARMELIANA* Jepson. Stems slender, $1\frac{3}{4}$ to $2\frac{1}{2}$ ft. high, leafy; leaflets 9 to 17, thin, ovate, incised-serrate, mostly about $\frac{1}{2}$ in. long; calyx-tube becoming purplish in age.—Carmel River.

6. *P. elata* Greene. Stems erect, $1\frac{1}{2}$ to 2 ft. high; herbage glandular, pilose-pubescent; radical leaves 6 to 12 in. long, the leaflets 15 to 19, thin, cuneate-obovate, $\frac{1}{2}$ in. long or less, once or twice incisely cleft; flowers solitary or in 3s; bractlets of the calyx equaling the segments, lanceolate; petals spatulate, white; stamens 10, 5 short and with filiform filaments, the other 5 with filaments deltoid-dilated at base.

Middle North Coast Ranges from Howell Mt. and Calistoga northward to Elk Mt., Lake Co. July.

7. *P. kelloggii* Greene. Stems stout, ascending or reclining, 1 to 2 ft. long; herbage glandless, white-silky with short dense hairs; radical leaves 4 to 10 in. long, the leaflets obovate, coarsely toothed, $\frac{1}{2}$ to 1 in. long; calyx-tube cup-shaped, its lobes lanceolate, equaled by the oblong entire bractlets; petals white, spatulate-oblong, 3 lines long.—(*Horkelia californica* C. & S. var. *sericea* Gray.)

San Francisco Bay region to Monterey Co.

8. *P. tenuiloba* (Gray) Greene. Stems about 1 ft. high; radical leaves 4 to 6 in. long, mostly villous with grayish hairs; leaflets 8 to 15 pairs, 2 or 3 lines long, cuneate-obovate, deeply 4 to 8-cleft into linear lobes, the segments rather less than $\frac{1}{2}$ line wide; upper leaves with fewer leaflets, these narrow and few-lobed or linear and entire; flowers in close cymes; calyx 2 lines long, with linear

lobes; petals narrowly cuneate, notched at apex, exceeding the calyx.—(*Horckelia fusca* var. *tenuiloba* Torr.)

Laguna of Santa Rosa Creek, *Bigelow*, 1854. Var. *MICHENERI* Jepson. Leaves 3 in. long, villous when young, glabrate in age; leaflets crowded, the lobes narrowly oblong, obtuse; cymes very much condensed; petals cuneate-obcordate; filaments broadly dilated, of nearly uniform breadth from base to apex.—Mt. Tamalpais, *Michener*.

9. *P. bolanderi* (Gray) Greene. Stems very sparingly leafy, 2 to 10 in. high, the leaves mainly tufted on the branching crown of the root, densely hoary-pubescent, 1 to 2 in. long; leaflets cuneate-obovate, 2 or 3 lines long, toothed or cleft at apex, the teeth acute; flowers in a rather open cyme; calyx 2 lines long, about equaling the white oblong-spatulate petals; calyx-lobes and bractlets lanceolate; achenes minutely granular.—(*Horkelia bolanderi* Gray.)

Dry hills about the southern shores of Clear Lake; to be expected in northeastern Napa Co. July.

9. AGRIMONIA L. AGRIMONY.

Perennial herbs with pinnate leaves and serrate leaflets. Flowers yellow, in racemes. Bracts 3-cleft. Calyx-tube turbinate, contracted at the throat and the upper part beset with a ring of hooked prickles, indurated in fruit and enclosing the 2 achenes; calyx-limb 5-cleft, the lobes closing over the throat after flowering. Stamens 5 to 15. Styles terminal. (Corruption of the Greek word *argema*, a disease of the eye, the plants reputed to be medicinal.)

1. *A. gyrosepala* Wallr. COMMON AGRIMONY. Stems erect, 2 to 3 ft. high; herbage glandular, and both hirsute and puberulent; leaflets 5 or 7, with interposed smaller ones, ovate or obovate, $3\frac{1}{2}$ in. long or less, coarsely toothed, entire at the base; terminal leaflet usually largest and cuneate at base; flowers $2\frac{1}{2}$ lines long.—(*A. eupatoria* of Bot. Cal.)

Borders of woods in the mountains: Elk Mt., Lake Co.; northern Sierra Nevada.

10. ACAENA L.

Perennial herbs with a woody base, pinnate leaves and pinnatifid leaflets. Flowers in more or less crowded spikes. Calyx persistent, its tube oblong, contracted at the throat, at length armed with retrorsely barbed prickles; limb 5 to 7-parted, valvate, deciduous. Petals none. Stamens commonly 3 to 5, but varying from 1 to 10. Pistils 1 or 2, free and distinct; style terminal; ovule solitary, suspended. Achene enclosed in the indurated calyx. (Greek *akaina*, a thorn, in reference to the spines on the calyx.)

1. *A. trifida* R. & P. Flowering stems erect with decumbent base, 5 to 13 in. high, sometimes almost naked, the leaves borne mostly at base or tufted on the short woody branches of the root-crown; herbage villous, especially when young, and more or less silky on the under surface of the leaves; leaflets 11 to 17, nearly uniform, 3 to 4 lines long, pinnately cleft into 3 to 7 segments; flowers green, in a crowded spike, or the lower flowers remote; calyx-tube white-hirsute with short hairs and armed with slender prickles, in fruit 4-angled; stamens dark purple; achene round-oblong.

Dry or rocky soil of hilltops in the Coast Ranges near the ocean from Marin Co. and the Oakland Hills to the Gabilan Range and Monterey. June.

11. ALCHEMILLA L. LADY'S MANTLE.

Ours a diminutive annual herb with palmately-lobed leaves and sheathing stipules. Flowers minute, greenish, pediceled and fascicled in the axils. Calyx

persistent, its tube pitcher-shaped, *i. e.*, enlarged above the base and somewhat contracted at the throat; limb 4 or 5-parted and bearing an equal number of alternate bractlets, or these minute or obsolete. Petals none. Stamens 1 to 4. Pistils 1 to 4 (in ours 1), distinct, the slender style lateral or arising from near the base. Achene ovate, slightly compressed, smooth, concealed in the tube of the persistent calyx. (So named because valued in alchemy.)

1. *A. arvensis* (L.) Scop. Simple or commonly branching from the base, 1 to 3 in. high, the branches slender and flower-bearing throughout; herbage scantily pubescent with soft hairs; leaves fan-shaped, 3-parted, the segments 2 or 3-cleft; calyx about $1\frac{1}{2}$ line long, the tube usually densely hirsute and much contracted under the lobes.

Hills and plains, common. Apr.

12. OSMARONIA Greene.

Shrubs with simple entire deciduous leaves and caducous stipules. Flowers dioecious, white, fragrant, in nodding racemes terminating leafy branchlets. Calyx turbinate-campanulate, 5-lobed, deciduous. Staminate flower with spreading petals; stamens 15, in 3 rows, 10 inserted with the petals, 5 inserted low down upon the disk lining the calyx-tube. Pistillate flower with erect petals; stamens present but abortive; pistils 5, simple, free and distinct, glabrous; styles short, lateral, jointed at base; ovules 2 to each ovary, pendulous. Fruit consisting of 1 to 5 ovoid drupes with a thin pulp and bony stone. Seed solitary; cotyledons convolute. (Osme, Greek adjective meaning fragrant, and Aronia, a genus founded by Persoon and now referred to *Amelanchier*.)

1. *O. cerasiformis* (T. & G.) Greene. OSO BERRY. Erect, 3 to 9 ft. high, the branchlets reddish; leaves glabrous, broadly oblong, narrowed to each end, mucronate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long when mature, short-petioled; racemes with conspicuous bracts, several from leafy winter buds, rarely solitary; petals of staminate flower ovate, 3 lines long; petals of pistillate flower spatulate or obovate, 2 lines long; drupes blue-black, 5 to 7 lines long.—(*Nuttallia cerasiformis* T. & G.)

Frequent in the outer Coast Ranges from the San Lucia Mts., San Francisco and the Oakland Hills to Humboldt Co. and northward. Rare in the inner Coast Range. Marble Fork, Kaweah River, Sierra Nevada. The pulp of the fruit is bitter but not poisonous.

13. PRUNUS L. PLUM.

Shrubs or small trees. Leaves simple, serrate. Flowers white, in corymbs or in racemes from lateral buds borne on wood of the previous season, appearing before or with the leaves. Petals 5. Calyx 5-cleft, deciduous after flowering. Stamens 15 to 30. Pistil 1; style terminal. Drupe globose, without bloom; flesh sweet or bitter; stone globose or compressed, bony. (The Latin name of the Plum.)

Leaves conduplicate in bud; drupe globose.—CHERRIES.

Flowers in corymbs; drupe small, bright-red.....1. *P. emarginata*.

Flowers in racemes; drupe dark-red.

Peduncle leafy; drupe small, its flesh astringent; foliage deciduous....2. *P. demissa*.

Peduncle leafless; drupe large, its flesh sweetish; foliage evergreen....3. *P. ilicifolia*.

Leaves convolute in bud; drupe red, oblong, $\frac{3}{4}$ to 1 in. long.—PLUMS.

Flowers in umbels.....4. *P. subcordata*.

1. *P. emarginata* Walp. BITTER CHERRY. Deciduous shrub 3 to 8 ft. high, very rarely arboreous and 20 ft. high; bark smooth, dull red; leaves ovate or

more commonly oblong-obovate, mostly obtuse, finely serrulate, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, on petioles 1 to 3 lines long; blade with 1 or 2 glands just above junction with petiole; flowers 3 to 10 in short corymbs; drupes 4 or 5 lines long, bright red, the pulp intensely bitter.—(*Cerasus emarginata* Dougl.)

Sierra Nevada and Coast Ranges, abundant at 4,000 to 8,000 feet, also at lower levels near the ocean, as in cool cañons of the Berkeley Hills at 500 feet; mountains of Southern California (5,000 to 9,000 feet). Forms extensive shrubby thickets on dry or moist gravelly mountain slopes, and attains its largest size near streams or on moist benches.

2. *P. demissa* Walp. WESTERN CHOKE-CHERRY. Erect slender deciduous shrub, 2 to 10 ft. high, or rarely a small tree up to 20 ft. high; leaves oblong-ovate or more commonly oblong-obovate, acute at apex or abruptly short-pointed, finely serrate, 1 to $3\frac{1}{2}$ in. long; petiole $\frac{1}{2}$ in. long, with 1 or 2 glands just below its summit; racemes 2 to 4 in. long, terminating more or less leafy peduncles; drupe red or dark purple, $3\frac{1}{2}$ lines long, astringent.

Sierra Nevada, 2,500 to 6,000 ft.; Coast Ranges, widely scattered from the sea-coast to the interior.—(*Cerasus demissa* Nutt.)

3. *P. ilicifolia* Walp. ISLAY. Evergreen shrub or small tree 5 to 25 ft. high; leaves coriaceous, elliptic or ovate, acute or obtuse, spinose-toothed, 1 to 2 in. long, short-petioled; racemes 1 to $2\frac{1}{2}$ in. long, on axillary leafless peduncles; flowers 2 lines long; drupe red or dark purple, 6 to 8 lines thick, slightly obcompressed, apiculate; flesh thin, sweetish when ripe.—(*Cerasus ilicifolia* Nutt.)

Mostly near the coast: Cordelia, Oakland Hills, San Francisco, Santa Cruz Mts. and southward to Southern California. Also called Evergreen Cherry.

4. *P. subcordata* Benth. SIERRA PLUM. Deciduous shrub 4 to 7 ft. high or sometimes arborescent and 20 ft. high, with crooked and rough gray-brown branches and more or less spinescent branchlets; leaves ovate or elliptic to almost round, obtuse or truncate at base, rarely subcordate, 2 in. long or less, on petioles 2 or 3 lines long; flowers appearing with the leaves, 2 to 4 in a cluster, on pedicels $\frac{1}{2}$ in. long; sepals linear or slightly acute, $1\frac{1}{2}$ lines long; petals obovate, somewhat concave, 4 lines long; stamens 25 or 30; drupe red, $\frac{3}{4}$ to nearly 1 in. long, the pulp rather hard but more or less edible.

Southern Sierra Nevada to Siskiyou Co. and south in the Coast Ranges to the Vaca Mts., Mt. Diablo and Mt. Tamalpais, rare in our region and mostly toward the interior. The author has never observed it to set good fruit in the Bay region.

14. HETEROMELES Roem.

Evergreen shrub with simple coriaceous serrate leaves. Flowers white, small, numerous, in little cymes disposed in a terminal corymbose panicle. Calyx turbinate, 5-cleft. Petals 5, spreading. Stamens 10, in pairs opposite the calyx-teeth; filaments dilated at base and somewhat connate. Pistils 2 or 3, lightly united, tomentose above, only lightly adherent to the fleshy calyx-tube, the thickened persistent calyx-teeth closed over them in fruit. Fruit bright red, ovoid, berry-like. Seeds 1 or 2 in each cell. (Greek heteros, different, and melon, an apple.)

1. *H. arbutifolia* (Lindl.) Roem. CHRISTMAS BERRY. TOYON. Shrub, rarely a small tree, 5 to 15 ft. high; leaves oblong, acute at base and apex, dark green, lighter beneath, sharply serrate, 2 to 4 in. long, on petioles $\frac{1}{2}$ to $\frac{3}{4}$ in. long; panicle in anthesis rather dense, 2 or 3 in. high; corolla $2\frac{1}{2}$ lines in diameter; fruit 3 or 4 lines long, the seeds obovate, flat on one side, convex on the other, $\frac{1}{2}$ as long.—(*Photinia arbutifolia* Lindl.)

Throughout the Coast Ranges and Sierra Nevada, and southward to Southern and Lower California. Frequent along streams and gulches in the lower hills, and also abundant on stony slopes at middle elevations, especially from Napa to Humboldt cos. Fl. July. One of the most handsome of Californian shrubs when covered from November to January with its fine clusters of crimson berries.

15. CRATAEGUS L. THORN.

Thorny shrubs with simple toothed or lobed leaves. Flowers mostly white, heavy-scented, corymbose. Calyx-tube urn-shaped. Petals rounded. Stamens 5 to 20. Ovary inferior, or its summit free, 2 to 5-celled, or the 2 to 5 carpels merely contiguous and not united; styles distinct. Pome more or less drupe-like, red or purple, containing 2 to 5 bony 1-seeded nutlets, these united or separable; calyx-teeth persistent. (Greek *kratos*, strength, in reference to the wood.)

1. *C. rivularis* Nutt. Shrub 9 to 14 ft. high; thorns stout, $2\frac{1}{2}$ in. long; leaves elliptic to obovate, doubly serrate, entire towards the base and often cuneate, shortly petioled, $1\frac{1}{4}$ to $2\frac{3}{4}$ in. long; fruit reddish brown (or nearly black?), 3 or 4 lines long.

Sonoma Co. to Siskiyou Co. and northward. Rare within our limits.

16. PYRUS L. PEAR. APPLE.

Deciduous trees or shrubs with simple leaves and stipules which disappear early. Flowers in corymbs. Calyx-tube urn-shaped. Petals white or pink, with claws. Ovary inferior, 2 to 5-celled, ovules 2 in each cell, the carpels chartaceous; styles as many as the cells, united at base. Fruit a pome, in the subgenus *Malus* (apple) more or less globose and sunken at each end.—(The Latin name of the Pear.)

1. *P. rivularis* Dougl. OREGON CRAB APPLE. Small tree or many-stemmed shrub 10 to 30 ft. high; leaves ovate, pointed, serrate, green above, pale, pubescent and eventually rusty beneath, 1 to $3\frac{1}{4}$ in. long, those of the sterile branchlets mostly 3-lobed or with a coarse tooth on each side, those of the flowering branchlets rarely lobed or toothed; corymbs 4 to 9-flowered; petals elliptical, 3 to 5 lines long, commonly with toothed auricles just above the very short claw; stamens 18 or 19; carpels commonly 3; fruits 2 or 3 in a cluster, oblong or oblong-ovoid, 6 or 7 lines long and $4\frac{1}{2}$ or 5 lines thick, not sunken at base, yellowish (or pinkish on one side), aging purple-black; calyx-lobes at length deciduous.—(*Malus rivularis* Roem.)

North Coast Ranges, mostly near the coast (Sonoma to Eureka) and northward to Washington.

17. AMELANCHIER Medic. JUNE BERRY.

Shrubs or small trees with simple leaves. Flowers white in racemes. Calyx-tube campanulate, more or less adnate to the ovary, the limb 5-parted, the lobes narrow, reflexed, and persistent. Petals 5, ascending. Stamens indefinite, about 20, the outer row with longer filaments. Pistil 1; styles 5, united below; ovary partly or wholly inferior, 5-celled, each cell in fruit divided into 2 by a partition from the back. Fruit berry-like, globose, the cells 1-seeded. (Savoy name of the Medlar.)

1. *A. alnifolia* Nutt. Shrub 8 to 15 ft. high; leaves mostly elliptic, sharply serrate near the apex or less commonly entire, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; petioles 4 to 6 lines long; racemes short and rather dense; petals broadly oblong, or somewhat cuneate at base, 5 lines long; fruit purplish, $2\frac{1}{2}$ or 3 lines in diameter.

Hill slopes: Coast Ranges (San Francisco, Napa Range and northward); Sierra Nevada.

LEGUMINOSAE. PEA FAMILY.

Herbs, shrubs, or trees with alternate stipulate leaves, in ours compound (except in *Cercis*). Leaflets 1 to many, usually entire. Calyx synsepalous, 5-toothed or -cleft (or in *Lupinus* bilabiate), mostly persistent. Corolla with 5 petals, in nearly all of ours papilionaceous, *i. e.*, highly irregular and butterfly-like: the upper petal is called the banner; the lateral petals are called the wings; the two lower petals are joined by their edges to form the keel; the banner in the bud enfolds the wings which in turn cover the keel-petals; all the claws are free from one another. Petals essentially hypogynous in ours. Stamens 10, united into a sheath around the ovary (monadelphous), or the upper stamen distinct from the others (diadelphous), or sometimes all distinct. Pistil 1, superior, 1-celled. Fruit a legume (2-valved pod), with 1 row of seeds on the ventral side, commonly opening by both the dorsal and ventral sutures, the valves twisting in opposite directions, or sometimes indehiscent. Seeds mostly kidney-shaped, without endosperm. The corolla of *Cercis* is nearly regular. *Amorpha* has but one petal. The exceptions to the ordinal diagnosis are many but only those which concern our flora are here noted. This is one of the largest of the natural orders, many species yielding important products.

A. Leaves simple.

Corolla obscurely papilionaceous, slightly irregular; shrubs.....1. *CERCIS*.

B. Leaves compound; corolla papilionaceous (except no. 6).

1. *Stamens* distinct; leaves palmately 3-foliolate.2. *THERMOPSIS*.

Flowers yellow, in racemes; stipules conspicuous; herbs.....2. *THERMOPSIS*.
Flowers purple, solitary; stipules none; very spiny shrub.....3. *PICKERINGIA*.

2. *Stamens* diadelphous or monadelphous.

a. Calyx deeply bilabiate.

Stamens 5 long and 5 short, their filaments monadelphous but free at apex; flowers racemose, mostly in whorls; leaves palmate, of 4 to many leaflets.....4. *LUPINUS*.

b. Calyx 5-toothed.

Leaves 3-foliolate, the leaflets denticulate or serrulate. (See also no. 10.)

Flowers in a raceme or spike; corolla deciduous after flowering; leaves pinnately 3-foliolate.

Pod curved or spirally coiled; style subulate.....5. *MEDICAGO*.

Pod small, globose; style filiform.....6. *MELILOTUS*.

Flowers in a head or head-like inflorescence, rarely in a capitate umbel or short spike; corolla withering-persistent after flowering; leaves palmately 3, sometimes 4 or 5-foliolate7. *TRIFOLIUM*.

Leaves unequally or odd pinnate (one palmate in no. 10), the leaflets entire.

Flowers in umbels, sometimes solitary; leaflets commonly 3 to many, sometimes 1 or 2

8. *LOTUS*.

Flowers in racemes or spikes; leaflets many (3 or 5 in no. 10.)

Herbage glutinous or glandular-dotted.

Pod not prickly; flowers purple or whitish.

Shrub; corolla of 1 petal.....9. *AMORPHA*.

Herb; corolla of 5 petals.....10. *PSORALEA*.

Pod prickly, indehiscent; flowers yellowish.....11. *GLYCYRRHIZA*.

Herbage not glandular; pod usually inflated or turgid.....12. *ASTRAGALUS*.
Leaves equally pinnate, the rachis produced into a branched tendril, rarely terminating in a bristle or imperfect leaflet; flowers in spikes or racemes.

Style hairy all around at summit.....13. *VICIA*.

Style hairy on the upper side.....14. *LATHYRUS*.

1. *CERCIS* L. JUDAS TREE.

Shrubs. Flowers red-purple, in umbel-like fascicles, appearing from winter buds in advance of the simple leaves. Stipules caducous. Calyx in anthesis broader than long, with 5 broad obtuse teeth. Corolla obscurely papilionaceous;

banner smaller than the wings and enclosed by them in the bud; keel-petals larger than the wing-petals and not united. Stamens 10, distinct, declined, the filaments clavate-dilated towards the base. Pod oblong, very flat, the upper suture with a winged margin. Embryo straight. (Kerkis, Greek name of the oriental Judas Tree.)

1. **C. occidentalis** Torr. WESTERN RED-BUD. Stems usually clustered, forming a clump, the branches rather widely spreading, 8 to 15 ft. high; leaves round, cordate at base with nearly closed sinus, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. broad; pod about 2 in. long and 8 lines wide.

Foothills of the Sierra Nevada and inner Coast Ranges. Mar.-Apr.

2. THERMOPSIS R. Br. FALSE LUPINE.

Perennial herbs with commonly erect clustered stems. Leaves palmately 3-foliolate, petioled, and with free leaf-like stipules. Flowers yellow, in a terminal raceme, the pedicels subtended by persistent bracts. Calyx campanulate, deeply toothed, the two upper teeth in ours almost completely united. Banner roundish, shorter than the oblong wings, the sides reflexed; keel nearly straight, obtuse, its petals very lightly joined, equaling the wings. Stamens distinct. Pod long, linear, flat, several-seeded. (Greek thermos, lupine, and ops, resemblance.)

1. **T. macrophylla** H. & A. Stems somewhat branched above, 1 to 2 ft. high; leaves silky or whitish-pubescent when young, soon glabrate, at least above; leaflets broadly or narrowly obovate and often more or less rhomboidal, acute at each end, or some obtuse at apex (even on same plant), $1\frac{1}{2}$ to 3 or 4 in. long; stipules strongly oblique or not at all oblique, even on the same plant, longer than the petioles; upper lip of calyx slightly notched; lower calyx-teeth shorter than or as long as tube; raceme rather dense, 3 to 6 in. long; pod straight, silky, 2 to 5-seeded.—(*T. californica* Wats.)

Monterey, Santa Cruz Mts. and Napa Valley northward to Mendocino Co. Not known from the inner North Coast Ranges nor from Contra Costa or Alameda cos. (Cf. Zoe, v. 77.) Var. **VELUTINA** Greene. Leaflets small, with a dense velvety pubescence.—Mt. Hamilton.

3. PICKERINGIA Nutt.

Very rigid and spiny evergreen xerophytic shrub. Leaves palmately 1 to 3-foliolate, nearly sessile and without stipules. Flowers large, purple, axillary, solitary and short-pedicel. Calyx campanulate with a turbinate base, the border with 4 very low broad teeth. Petals equal, the banner orbicular with reflexed sides, the wing- and keel-petals oblong, the latter distinct and straight. Stamens distinct, inserted low down on calyx-tube. Pod linear, flat, stipitate, straight, several-seeded. (Charles Pickering of the Wilkes Expedition, which visited California in 1841.)

1. **P. montana** Nutt. PEA CHAPARRAL. Densely branched shrub, 3 to 8 ft. high, the branchlets very spinose; leaflets obovate, entire, 2 to 6 lines long; flowers near the ends of the branchlets, rose-purple, $\frac{3}{4}$ in. long, on very short pedicels; pedicels bearing 2 minute subulate bractlets near the middle; stamens persistent; pod exerted on the stipe, about 2 in. long, 6 to 10-seeded, somewhat constricted between the seeds.—(*Xylothermia montana* Greene.)

Higher altitudes of the Coast Ranges: frequent on dry slopes from near Ukiah, Mt. St. Helena, the Vaca Mts. and Mt. Tamalpais southward to Southern California. May-June. One of the most characteristic of chaparral shrubs

(see chaparral). Pod sickle-shaped when young. Banner with a yellowish or whitish spot at base. Fruits very sparingly.

4. LUPINUS L. LUPINE.

Herbs or low shrubs with palmately 4 to 15-foliolate leaves. Stipules adnate to the base of the petiole, seldom conspicuous. Flowers showy, blue, pinkish, yellow or white, in terminal racemes or spikes. Calyx deeply bilabiate. Banner roundish, the sides mostly reflexed; wings commonly connivent by their edges in front of and thus enclosing the mostly falcate pointed keel. Stamens monadelphous, dimorphous, 5 with longer and basifixed anthers, the alternate 5 with shorter and versatile ones. Pod somewhat flattened, often constricted between the seeds. Cotyledons thick and fleshy. (Latin lupus, a wolf, these plants thought to rob the soil of its fertility.)

A. Pods linear or oblong.

Bracts deciduous; ovules several; cotyledons of the seedling petioled.

Low shrubs or at least suffrutescent, silky pubescent; petioles mostly short.

Flowers sulphur-yellow; raceme often 1 ft. long.....1. *L. arboreus*.

Flowers not yellow, mostly blue.

Herbage greenish; flowers blue or white; keel ciliate for its whole length; low, the stems merely suffrutescent.....2. *L. variicolor*.

Herbage silky.

Flowers bluish or lavender, the banner with a yellow spot; keel glabrous; no distinct trunk3. *L. chamissonis*.

Flowers blue; keel ciliate; shrub with a distinct trunk.....4. *L. albifrons*.

Perennial herbs.

Leaflets 5 to 7, more or less ciliate or ciliate.

Herbage canescently silky.

Leaflets oblanceolate or cuneate-oblong; root large, yellow; seashore species.....5. *L. littoralis*.

Leaflets spatulate-oblong; root not yellow; montane species.....6. *L. sericatus*.

Herbage greenish, comparatively glabrous; montane or of the hills.....7. *L. latifolius*.

Leaflets 7 to 9, linear-lanceolate, 1 to 1½ in. long; keel glabrous; plants mostly decumbent, with silky herbage.....8. *L. formosus*.

Leaflets 9 to 16, lanceolate or oblanceolate, 3 to 6 in. long; petioles ½ ft. long or more; plants erect, 3 to 5 ft. high, sparingly villous.....9. *L. polyphyllus*.

Annual herbs.

Flowers mostly 4 to 7 lines long; upper calyx-lip cleft or bifid.

Lower calyx-lip 3-toothed or entire; leaflets cuneate-obovate, obtuse or emarginate; plants very stout and succulent.....10. *L. affinis*.

Lower calyx-lip 3-dentate; leaflets oblanceolate, acute; plants slender, not succulent...11. *L. nanus*.

Flowers mostly 1½ to 3 lines long.

Slender plants; upper calyx-lip with divergent lobes.

Lower calyx-lip long, entire.....12. *L. micranthus*.

Lower calyx-lip deeply 3-cleft.....13. *L. trifidus*.

Stoutish plants; upper calyx-lip bifid, the ovate segments short and parallel; lower calyx-lip entire or slightly dentate.....14. *L. polycarpus*.

B. Pods short and roundish or ovate.

Bracts persistent; ovules 2; cotyledons of the seedling broad and united by their bases; annuals.

Upper lip of calyx herbaceous and entire; flowers pale yellow; stems simple below, widely branching above15. *L. luteolus*.

Upper lip of calyx more or less scarious, emarginate or cleft.

Flowers commonly white or yellow; stem simple below, branching at the middle....16. *L. densiflorus*.

Flowers light purple or flesh-color; stem commonly simple.....17. *L. microcarpus*.

1. *L. arboreus* Sims. TREE LUPINE. Distinctly arborescent and 4 to 8 ft. high, or lower and merely suffrutescent; lightly pubescent on the young stems and lower surface of the leaves; leaflets oblanceolate, 1 to 2½ in. long, 9 to 11 on the first leaves, 6 to 8 on the (later) leaves from the axils, these smaller; raceme with very indistinct verticils, often 1 ft. long; pedicels 5 lines long;

bracts linear, 7 lines long; upper lip of calyx slightly notched, the lower entire; corolla sulphur-yellow, 8 lines long; banner orbicular, mucronulate at apex, the sides reflexed; wings lightly coherent by their apices, inflated; keel falcate, purple-tipped, lightly ciliate; pod 2 to 3 in. long, 8 to 12-seeded; seeds oblong, dark.

Common in sandy soils near the ocean: Alameda; Angel Island; San Francisco and north and south along the coast. Apr. Economically of importance as a hold-fast in sand-dune country.

2. *L. variicolor* Steud. Low, 1 to 1½ ft. high, the stems woody only at the very base; herbage scantily hairy-pubescent; leaflets 8 or the lowermost 6, oblanceolate, 7 to 9 lines long; raceme mostly 1½ to 3 in. long, the whorls 1 to 4; flowers 6 or 7 lines long; banner white or pale blue; wings blue; keel ciliate for its whole length.

Hill-slopes near the seashore: San Francisco; Marin Co. Too near the next.

3. *L. chamissonis* Esch. Stems densely tomentose, woody below, 1 to 3 ft. high; leaflets 6 to 9, more or less silky-pubescent, oblong-oblanceolate; petioles short, mostly not as long as the leaflets; flowers indistinctly or not at all whorled, bluish or lavender, the banner with a permanent yellow spot; keel glabrous.

Near the seashore: San Francisco and Marin Co. May.

4. *L. albifrons* Benth. SILVER LUPINE. Branching bush 2 to 4 ft. high, with a distinct woody trunk; growth of the season silky-pubescent; leaflets 7 to 10, oblanceolate to obovate, 10 lines long or less, silvery-silky on both sides; petioles mostly longer than the leaflets; flowers deep blue, in mostly distinct whorls in a loose raceme often 1 ft. long; pedicels 3 lines long; upper calyx-lip broad, cleft, the lower entire; petals subequal; banner broad, with a whitish or sometimes yellow spot early changing to red-purple; keel ciliate; pod 2 in. long, 5 to 9-seeded; seeds oval, 2 lines long, brownish, with a marginal dark line.—(*L. eminens* and *jucundus* Greene.)

Abundant, especially on the higher hills, Coast Ranges and Sierra Nevada. Feb.-May. Sometimes low and caespitose, without a trunk.

5. *L. littoralis* Dougl. CHINOOK LIQUORICE. Stems slender, decumbent or ascending, 1 or 2 ft. long, from a yellow somewhat fleshy root; stipules very large; leaflets 5 to 7, oblanceolate or cuneate-oblong, acute, ½ to 1 in. long, at least half as long as the petioles, silky on both sides, the hairs short and appressed; flowers remotely whorled or more or less scattered in a short raceme; calyx-lips of nearly equal length, entire; banner red, shorter than the blue wings; keel ciliate; pod linear, hirsute; seeds linear, brown, with black spots.

Seashore from Pt. Reyes northward.

6. *L. sericatus* Kell. Stoutish, decumbent, 5 to 12 in. high, minutely but densely silky-canescens; leaflets 6 to 7, spatulate-obovate, obtuse or retuse, 1 to 1½ in. long, on petioles 1½ to 4 times as long; raceme ½ to 1 ft. long, rather long-peduncled; flowers deep purple; calyx-lips large, the upper cleft, the lower obscurely 3-toothed; keel slender-pointed, lightly ciliate; seeds light brown and somewhat mottled.

Howell Mt.; Mt. St. Helena; Cobb Mt. Apparently confined to the Mayacamas Range. May.

7. *L. latifolius* Agardh. Stems dark green and shining, erect, with slender branches, but mostly simple below, 2 to 4 ft. high, equally leafy, the basal leaves not long-stalked; almost or quite glabrous, except a minute appressed pu-

bescence on the stems and under the surface of the leaves; leaflets 5 to 8, broadly oblanceolate, thin, mucronulate, 1 to 3 in. long; racemes 6 to 17 in. long, slender-peduncled, loose, the verticils often distinct; pedicels slender; calyx-teeth elongated, the upper notched slightly at the narrow apex; corolla blue, changing to dull brown; keel ciliate below the middle.

Common plant in openly wooded cañons of the Coast Ranges: Ukiah; Vaca Mts.; Napa Range; Oakland Hills and southward. Apr.-June.

8. *L. formosus* Greene. Stems decumbent or ascending, 2 to 3 ft. long, the whole plant silky-pubescent; leaflets mostly 7 to 9, narrowly or broadly oblanceolate, abruptly acuminate, 1 to 1½ in. long, equaling the petiole; raceme with more or less distinct whorls but often dense, the peduncle short or scarcely any; flowers 6 to 7 lines long, rich violet; keel glabrous.

Rich high places in the fields and sandy lands of the Coast Range Valleys and the plains of the Sacramento and San Joaquin. July-Oct.

9. *L. polyphyllus* Lindl. Stem stout, erect, nearly simple, 3 to 5 ft. high, sparingly villous, equably leafy up to the inflorescence; petioles 6 to 12 in. long except the uppermost; leaflets 9 to 16, oblanceolate or lanceolate, sparingly hirsute beneath, glabrous above, 3 to 6 in. long; stipules adnate for half their length; raceme short-peduncled, dense, 1 to 2 ft. long; flowers not in whorls or only subwhorled, on long pedicels; calyx-lips of nearly equal length, entire; bractlets often wanting; corolla 6 or 7 lines long, with blue wings and red-purple banner; keel falcate, acuminate, glabrous; pod 1 to 1½ in. long, ¼ in. broad, 7 to 9-seeded.

Near the coast from Marin Co. (Sausalito, Pt. Bonita, and Tennessee Bay) northward; also in the interior at higher altitudes (Howell Mt., Mt. Shasta).

10. *L. affinis* Agardh. Stout and very succulent; stems fistulous, 14 to 20 in. high, branching mostly from the middle; glabrous except a short and sparse pubescence on the lower surface of the leaves; leaflets 6 or mostly 7 or 8, oblong-oblanceolate or broadly cuneate-obovate, obtuse or retuse, 1 to 2 in. long; petioles 1½ to 4 in. long; racemes 4 to 8, on short peduncles; flowers 6 to 7 lines long; bractlets short; upper calyx-lip with 2 divergent teeth, the lower lip entire; petals 5 to 6 lines long, deep bluish purple, the keel glabrous; ovary densely villous-pubescent.

North Coast Ranges southward to Southern California. Very common in late Feb. and in Mar. Especially characteristic of depressions in hills caused by recent or old landslides. Also common along the banks of winter water-courses in the hills and in low heavy soil generally. Var. *CARNOSULUS* Jepson, usually simple with the keel villous in the middle.—Berkeley Hills.

11. *L. nanus* Dougl. Slender, not succulent, 6 to 15 in. high, often branching from the base, villous or finely pubescent; leaflets 7 or 8, linear to oblanceolate, ½ to 1 in. long, usually acute, the petioles ½ to 3 times longer; racemes loose, short-peduncled, 3 to 7 in. long, of several distinct or somewhat indistinct whorls of large fragrant flowers; bracts exceeding the calyx; pedicels about 3 lines long; upper calyx-lip deeply cleft; lower calyx-lip 3-dentate, the middle tooth sometimes obscure or wanting; corolla blue, the banner with the white middle spot purple-dotted along the median sulcus and turning red-purple in age, 5 to 6 lines long; banner orbicular, retuse, with the sides reflexed; wings lightly joined, forming an obliquely ovate inflated sac; keel falcate, ciliate above the middle.

Common everywhere in the Coast Range region and rather variable. Flowering mostly in Apr.

12. *L. micranthus* Dougl. Slender, simple or more frequently branched from the base, erect or ascending, 5 to 18 in. high, pilose-pubescent, not at all succulent; leaflets 5 to 7, linear to linear-spatulate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, the petioles twice as long; racemes peduncled, whorls 3 to 6, distinct or indistinct; pedicels $1\frac{1}{2}$ lines long, elongating more or less in fruit; upper calyx-lip with divergent triangular acute lobes, the lower long, entire; corolla 2 to $2\frac{1}{2}$ lines long, blue; banner with a white spot changing to light blue or purple; wings narrow, appressed; keel falcate, densely pilose-ciliate above the middle to near the apex; pod 5 to 7-seeded.

Exceedingly variable species, common everywhere in May in the hill country and on the plains: Coast Ranges, Sacramento and San Joaquin valleys; Sierra Nevada foothills. There are apparent transitions to the next species. Var. *BICOLOR* Wats. Lower calyx-lip twice as long as the upper; corolla 3 to $4\frac{1}{2}$ lines long; folds on the center of the banner (covering the edges of the oblique portion of the wings) much more prominent.—Bay region and northward. Var. *PACHYLOBUS* Jepson. Peduncles stout; flowers small, subsessile in few whorls; upper calyx-lip notched, the lower entire, twice as long; pods very large.—Briones Hills, Contra Costa Co. Apr.

13. *L. trifidus* Torr. Branched from the base, 7 to 12 in. high, densely pilose, the younger parts canescent; leaflets mostly 6 to 8, linear to linear-spatulate; racemes very short, mostly 2 to 3, sometimes 4 in. long; upper calyx-lip deeply cleft with divergent segments, the lower deeply 3-cleft into long slender segments; corolla 2 to $2\frac{1}{2}$ lines long, blue, the white spot on the banner not changing in age; keel scarcely falcate, short and obtusely pointed, sparsely ciliate from above the middle to just below the apex; pod 6 to 8-seeded; seeds quadrate-ovate, dotted or diagonally marked.

Sandy soil about the Bay and along the seaboard: Alameda and San Francisco, southward to Santa Cruz Co. and Pacific Grove. Doubtless no more than a good variety of the next; best known by its strikingly pilose pubescence and 3-cleft lower calyx-lip.

14. *L. polycarpus* Greene. Erect, somewhat succulent, with rather stout branches from the base or above the middle, moderately pubescent; leaflets 6 to 8, linear-oblancoolate, $1\frac{1}{2}$ to 1 in. long; raceme narrow, rather short, with 4 to 7 distinct or indistinct whorls; pedicels 1 line long, ascending; upper calyx-lip 2-cleft, the lobes ovate, parallel; lower entire or obscurely dentate, somewhat longer; corolla $1\frac{1}{2}$ to 3 lines long, deep blue; banner obovate, retuse or truncate, the center white, with dark dots, changing to red-purple, the sides incurved, not reflexed; wings coherent at tip, inflated, exposing the base of the short and nearly straight keel; keel obscurely ciliate below the apex; pod rigid, slightly falcate, 1 in. long or more, 6 to 9-seeded.

Occurring in its typical form in rich soil of low fields about the Bay and in a modified form on the plains of the interior. Characterized chiefly by its rather robust habit, short narrow close racemes of small flowers and many large pods. Apr.

L. HIRSUTISSIMUS Benth. Robust, plants with fistulous stems, branching above the middle or at the base, 2 to 4 ft. high; herbage very hispid-bristly and nettle-like; leaflets 5 to 7, cuneate-obovate, obtuse and mucronate, or truncate, 1 to $1\frac{1}{2}$ in. long; racemes $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long; flowers blue; pod very hispid-bristly, $1\frac{1}{4}$ in. long.—Monterey and south to Southern California. Mar.-May.

15. *L. luteolus* Kell. Slender, simple below, loosely and widely branch-

ing above, 2 to 3½ ft. high, rigid, not succulent; pubescence of short appressed silky hairs; leaves scattered; leaflets mostly 7, cuneate-oblong, 1 in. long, obtuse or acute; bracts linear-setaceous, often exceeding the calyx; flowers 6 lines long, pale yellow, nearly sessile, in a dense raceme 1½ to 7 in. long; upper lip of calyx entire, not scarious, the lower 3-toothed.

Stream and river beds: Contra Costa Co.; Napa Valley; Lake Co. and northward.

16. **L. densiflorus** Benth. Resembling the last but more sparingly villous; stem stout, somewhat succulent, simple below, parted at the middle into many spreading branches; leaflets oblong-oblongate, very acute, mucronate; racemes 6 to 10 in. long, on long peduncles; bracts setaceous, much shorter than the calyx; flowers white, yellow, or sometimes rose-color; calyx sparingly pubescent, the upper lip scarious, deeply cleft, the lower long, toothed.

Hillsides and banks of gullies: North Coast Ranges and the Sacramento Valley southward to Southern California. Apr.-May. Flowers in this and the next 6 to 8 lines long.

17. **L. microcarpus** Sims. Simple or branched above, 1 to 1½ ft. high, somewhat succulent, villous throughout; leaves rather crowded; leaflets usually 9, cuneate-oblong, varying at apex from acutish to obtuse or emarginate, 1 to 2 in. long; bracts subulate-setaceous, equaling the calyx or shorter; flowers short-pedicel, purplish or flesh-pink; calyx densely hirsute, upper lip very short, subscarious, emarginate or cleft; lower obscurely 2 or 3-toothed; keel slightly ciliate; pod villous, 8 lines long.

Abundant on the plains of the Sacramento and San Joaquin; the same thing, apparently, at Alameda. Apr.-May.

5. MEDICAGO L. MEDICK.

Herbs, the leaves and flowers essentially as in *Melilotus*. Flowers in short spikes or loose heads. Pod small, 1 to several-seeded, incurved or coiled or spirally twisted, indehiscent. (Greek *Medike*, name given by Dioscorides to a plant from Media, perhaps Lucern. All the species naturalized from Europe.)

Perennial; flowers blue.....1. *M. sativa*.
Annuals; flowers yellow.

Pod 1-seeded, reniform, unarmed but strongly nerved.....2. *M. lupulina*.

Pod several-seeded, spirally coiled, margined with prickles.

Edge of the pod keeled, not grooved between the prickles; leaflets not spotted....3. *M. hispida*.

Edge of the pod furrowed between the prickles; leaflets with a large inky splotch on the upper face4. *M. arabica*.

Pod several-seeded, spirally coiled, unarmed.....5. *M. apiculata*.

1. **M. sativa** L. ALFALFA. Perennial from an elongated taproot, erect and smooth; leaflets oblong-obovate or linear-oblong, 8 to 10 lines long; flowers blue (5 lines long), in racemes; pod spirally twisted so as to form 2 or 3 complete rings or coils.

Borders of fields, not common beyond cultivation. Native of western Asia, cultivated for more than 20 centuries. Brought into California in 1854, it is our "King of Forage Plants," often producing ten tons of hay per acre per annum. Also valued as a bee plant, sometimes yielding 60 lbs. to the acre. Rarely called Lucern.

2. **M. lupulina** L. NONESUCH. BLACK MEDICK. Branching from the base into spreading procumbent stems 9 to 18 in. long; leaflets orbicular and more or less deltoid to cuneate-obovate, 4 to 6 lines long; peduncles longer

than the leaves (1 to $1\frac{1}{2}$ in. long), bearing a short dense spike of bright yellow flowers; pod reniform, 1-seeded, black when ripe.

Uncommon, but widely distributed. Redlands; Panamint Mts.; Tahoe; Oakland; Sacramento Co.; Humboldt Co.; Sisson. Apr.-June.

3. *M. hispida* Gaertn. BUR CLOVER. Branches spreading or procumbent, from a few in. to 2 ft. long; herbage nearly glabrous; leaflets obovate or orbiculate; stipules finely toothed; peduncles 3 to 5-flowered, rather longer than the leaves; pod twisted into a spiral of 2 or 3 turns, compressed, reticulated, the thin keeled edge bordered by a double row of more or less hooked or curved prickles.—(*M. denticulata* Willd.)

Very common throughout California on the plains, low hills and in the valleys. Mar.-June, but flowering in moist places at nearly all seasons. Prized as a dry season stock feed, the burs produced in great quantity and highly nutritious; also furnishes a green forage in spring. A rare instance of an aggressive immigrant having forage value.

4. *M. arabica* Huds. SPOTTED MEDICK. Very similar to no. 3, but the petioles with spreading hairs, the leaflets usually much larger (1 in. long) and with a conspicuous dark splotch in the center; pod compactly spiral, the margin thicker and more or less furrowed between the prickles.—(*M. maculata* Willd.)

San Francisco Bay region, uncommon but gradually extending. (Cf. *Erythea*, vi, 25.)

5. *M. apiculata* Willd. Stems spreading, 1 to 2 ft. long; leaflets deltoid, denticulate, except at the base, usually retuse and mucronate at apex, 5 or 6 lines long; pod unarmed or the spines very short, the sides strongly reticulated, the reticulations running to the edge and appearing as a row of tubercles on either side of the margin.

Widely distributed but rare: New Almaden; San Francisco; Knights Ferry; Crescent City. By some authors treated as a variety of no. 3.

6. MELILOTUS Juss. SWEET CLOVER.

Annual or biennial herbs with pinnately 3-foliate leaves and toothed leaflets. Herbage fragrant in drying. Flowers small, yellow or white, in spike-like racemes on axillary peduncles, in bud erect, soon deflexed and not again becoming erect. Calyx 5-toothed. Petals falling after flowering, free from the stamen tube. Stamens diadelphous, the upper one entirely free. Pod ovoid, straight, longer than the calyx, scarcely dehiscent, 1 or 2-seeded. (Greek meli, honey, and lotos, the ancient name of some plant belonging to this family. Naturalized from the Old World.)

Flowers white; plants 3 to 6 ft. high.....1. *M. alba*.
Flowers yellow; plants $1\frac{1}{2}$ to 3 ft. high.....2. *M. indica*.

1. *M. alba* Desr. WHITE MELILOT. Erect, simple below, branching above; leaflets broadly or narrowly oblong, tapering to both ends, or widest above the middle, serrate except at the very base, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; flowers 2 lines long, in racemes 1 to 4 in. long; pod somewhat wrinkled.

River beds throughout California or in moist valleys northward, rather rare as yet in our district: Riverside; Pomona; Scott Valley, Lake Co.; Klamath River, Humboldt Co.; Ft. Bidwell. Sometimes called Bokhara Clover. At Independence it has (as elsewhere) spread along the irrigation ditches and is "much in the way"; the bees feed upon the flowers and the honey produced from the abundant alfalfa is in consequence as if flavored with

cinnamon. Cattle avoid the herbage and the pods are said to be poisonous to sheep.

2. *M. indica* All. YELLOW MELLOOT. Main stem erect, with many rather spreading branches from above the base; leaflets broadly or narrowly cuneate-ovate, dentate or serrate but entire below the middle, truncate or retuse at apex, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; racemes 1 to 2 in. long, longer than the peduncles; flowers $1\frac{1}{2}$ lines long; pod with thinnish strongly wrinkled coat.—(*M. parviflora* Desf.)

Common throughout California. Apr.-May.

7. TRIFOLIUM L. CLOVER.

By LAURA F. McDERMOTT, M. S.

Herbs with palmate or short-pinnate leaves; leaflets generally 3, sometimes 4 to 7; stipules foliaceous, united at the base and clasping the petioles. Flowers white, pink, yellow, red, or purple, in heads. Heads sometimes loose (umbellate) or spicate. Calyx 5-toothed, sometimes bifid or trifid. Petals united with the stamen-tube or free, persistent and withering. Stamens diadelphous, 9 stamens united $\frac{1}{2}$ their length into a tube-like fold, the tenth stamen always free, in a separate whorl or attached to the banner. Pod globose to elongated, 1 to 8 (mostly 1 to 2)-seeded, included within the persistent calyx. (Latin tres, three, and folium, leaf.)

A. Heads involucre; annuals except no. 5.

1. Corolla conspicuously inflated.

- Involucre large, the lobes lanceolate, entire.....1. *T. fucatum*.
Involucre small, the lobes obtusely rounding or involucre reduced to a ring.....2. *T. depauperatum*.

2. Corolla not inflated.

- Involucre a flat or spreading disc with various-shaped margin.
Margins of involucre aciculary lobed but not toothed; calyx-teeth dilated, tridentate or simple.
Plant strictly glabrous.....3. *T. tridentatum*.
Plant pubescent, fistulous and clammy.....4. *T. obtusiflorum*.
Margins of involucre lobed, the lobes toothed; calyx-teeth not dilated but subulate.
Flowers large, each floral whorl subtended by an involucre.....5. *T. involucreatum*.
Flowers small, enclosed within 1 or 2 involucre.
Keel with long rostrate beak.....6. *T. appendiculatum*.
Keel not long rostrate, but abruptly acute.....7. *T. variegatum*.
Margins of involucre lobed, the lobes lanceolate, entire or an occasional lobe divided; head and involucre very small.....8. *T. oliganthum*.
Involucre campanulate to bowl-shaped.
Lobes of involucre toothed.
Calyx-teeth simple, much shorter than the calyx-tube.....9. *T. microdon*.
Calyx-teeth awn-like, plumose, the middle tooth once or twice forked.....10. *T. barbigerum*.
Calyx-teeth characteristically many-forked and glabrous.....11. *T. cyathiferum*.
Lobes of involucre entire; calyx-teeth broadly subulate with scarious margins.....12. *T. microcephalum*.

B. Heads naked.

1. Flowers pedicellate, in age reflexed.

- Annuals.
Plant strictly glabrous.
Calyx-teeth scarious with bristled or ciliated margins; flowers light pink.....13. *T. ciliatum*.
Calyx-teeth not scarious, margins entire; flowers a rich rose-red to cream color.....14. *T. gracilentum*.
Plants pubescent, especially the peduncles and calices; leaflets entire or conspicuously bifid and spreading; flowers pink.....15. *T. bifidum*.
Perennials.
Plant small; calyx glabrous; flowers cream-color.....16. *T. repens*.

Plant large.

Calyx sparsely pubescent; flowers tinged with pink.....17. *T. hybridum*.

Calyx characteristically hairy, strongly cross-nerved at base of teeth; flowers rose-red... 18. *T. pratense*.

2. *Flowers sessile, never reflexed; annuals.*

Heads pedunculate, elongate-ovate, small.....19. *T. alboburpureum*.

Heads sessile, in pairs.....20. *T. macraei*.

Heads large, globose.

Corolla large, showy, much longer than the calyx.....21. *T. dichotomum*.

Corolla small, inconspicuous, entirely obscured by the long and plumose calyx-teeth... 22. *T. olivaceum*.

Heads long cylindrical, truncate; flowers showy.....23. *T. californicum*.

1. ***T. fucatum*** Lindl. SOUR CLOVER. Stems stout, fistulose, succulent, diffuse, 1 to 2¾ ft. long; stipules large, broadly subulate, acuminate, the margins membranous; leaflets rhombic-ovate, 5 to 12 lines broad, broadly dentate, sometimes dentate-setate; heads large, 1 to 1½ in. in diameter; involucre 5 to 9-lobed, its margins scarious, entire; flowers pedicellate, cream-color tinged with light green, in age inflating and turning a deep pink; keel dark purple; calyx very small, scarious, the teeth short, unequal; pod stipitate, 3 to 8-seeded, the seeds 1 line in diameter.

A most singular species, found throughout California, growing rankly in low alkaline and brackish places. Acts much like a weed, since abundant along railroad tracks and country roads. Possibly introduced from South America. Apr.-June. Forma *VIRESCENS* McDer. Smaller; leaflets spatulate, pectinate to pectinate-dentate; calyx-teeth reduced to 3, longer than the calyx-tube; pod 3-seeded.—Dry hilly parts of Napa, Solano and Colusa cos. (var. *virescens* Jepson.) Var. *GAMBELLII* Jepson. Procumbent and very succulent; leaflets rhombic, thick, glaucous; calyx-teeth very long, 2 to 3-cleft.—Inner South Coast Ranges. Forma *FLAVULUM* McDer. Of the same procumbent habit as var. *gambellii*; leaflets small, the margins entire; calyx-teeth simple, equaling or exceeding the calyx-tube.—Widely and abundantly distributed in marshy places of the sea-coast counties (var. *flavulum* Jepson).

2. ***T. depauperatum*** Desv. Slender, glabrous, ascending, 4 to 8 in. high; stipules ovate, lanceolate; leaflets cuneate-emarginate, denticulate, 5 lines long; peduncles slender, wiry; heads loose, 2 to 7-flowered, subtended by an exceedingly small involucre; banner enclosing the small wings and keel; pod stipitate, 2 to 6-ovuled, commonly 2-seeded.

The most abundant clover of the alkaline areas of California. Owing to the variation of the involucre and leaflets we have the following varieties and forms: Forma *LACINIATUM* McDer. A leaf form growing near or partly in water; leaflets deeply and laciniately toothed.—Not so abundant as the species (var. *laciniatum* Jepson). Var. *DIVERSIFOLIUM* McDer. Larger than the species, 1 to 2 ft. high; leaflets oblong-ovate; margins repandly serrulate toward the apex; involucre very small, with 6 to 9 tiny lobes; heads many (8 to 15)-flowered.—More common than the species (*T. amplexans* var. *hydrophilum* Jepson.) Var. *STENOPHYLLUM* McDer. Very slender; leaflets linear, 5 to 9 lines long, ¼ to ½ line broad.—A coast form from Sonoma to San Diego Co. (*T. stenophyllum* Nutt.) Var. *STENOPHYLLUM* forma *FRANCISCANUM* McDer. Dwarf, the small leaflets as broad as long, rounded at the apex.—Same localities as the last (*T. franciscanum* Greene). Var. *STENOPHYLLUM* forma *LACINIFOLIUM* McDer. Leaflets laciniately toothed; lobes of the involucre highly developed as in var. *stenophyllum*.—Not common. Mar. Var. *AMPLEXANS* McDer. Stout, 1 to 1¾ ft. high; involucre large, 5 to 6-lobed, the lobes rounded, margin scarious.—Abundant on the plains of the

Sacramento and San Joaquin (*T. amplexens* T. & G.). Var. *AMPLEXENS* forma *TRUNCATUM* McDer. Very large; stems flaccid; leaflets and involucre larger; inner whorl of flowers subtended by a very small involueral ring.—A rich soil form of western California (*T. truncatum* Greene).

3. *T. tridentatum* Lindl. Stems curving outward at the base in a whorl of three or more, $\frac{2}{3}$ to $1\frac{1}{2}$ ft. high; leaves linear-oblong to lanceolate, serrate-setate to entire; heads hemispherical, broader than long, the flowers standing out conspicuously, the wings protruding at right angles from the tube-like whorl of the banner; divisions of the involucre very short; calyx-teeth dilated, tridentate, shorter than the calyx-tube.

Very common from the coast to the Sierra foothills, exhibiting many ecological variations as included under the following varieties and forms: Forma *TRIMORPHUM* McDer. Slender and more decumbent than the species; involucre deeply cleft into unequal narrowly lanceolate lobes; calyx-teeth not always tridentate.—Bay region and Sierra Nevada foothills (*T. trimorphum* Greene). Var. *SEGETUM* McDer. Tall, often 2 ft. high; stems hollow, 4 to 5 lines thick; leaflets $2\frac{1}{2}$ in. long, $\frac{1}{2}$ in. wide; heads broadly conical; flowers large, the tridentate calyx-teeth long, acicular.—The largest and most luxuriant variety, abundant in the Bay region (*T. segetum* Greene). Var. *ACICULARE* McDer. Erect; peduncles short; divisions of involucre unequal, long-acicular; calyx-teeth dilated, simple, becoming abruptly long-acicular.—Widely distributed (*T. aciculare* Nutt.). Var. *ACICULARE* forma *WATSONII* McDer. Very slender; leaflets linear; heads conical, involucre reduced; calyx-teeth simple, the tip acicular, shorter than in the variety.—Range more restricted, Napa to Fresno (*T. watsonii* Loja.).

4. *T. obtusiflorum* Hook. Large and erect, hispidulous throughout; stems hollow, clammy, 2 to 4 lines thick; leaflets large, obovate-oblancoate or oblancoate, obtuse or acute, the margins remarkably fringed; peduncles $2\frac{1}{2}$ in. long, axillary or dichotomously branched; heads large; involucre small; calyx-teeth simple, dilated near base.

Widely distributed throughout California but rare as compared with its relative *T. tridentatum*. The clamminess of the entire plant, even on dry summer days, makes it easily recognizable.

5. *T. involucreatum* Ortega. Cow CLOVER. Strictly glabrous, low caespitose (the numerous small leaves borne on a short stem) or tall; stems thick but flaccid; petioles long; small leaflets obcordate or obtuse-oblancoate; large leaflets obtuse-oblong or ovate, or rhombic-oblancoate, the margins serrulate-setate; heads large, showy, the flowers purple, rose-red or pinkish, lighter at the top; involucre deeply or slightly lobed, each lobe 3 to 5-toothed; calyx 10-nerved; pod 2 to 6-seeded.—(*T. wormskjoldii* Lehm.)

Frequent along streams, by springs or in salt-marshes. Apr.-June.

6. *T. appendiculatum* Loja. Glabrous; stems erect, thick and fistulous; stipules reflexed or spreading, irregularly lacinate; leaflets rhombic, obtuse-obovate or broadly oblancoate; involucre 7 to 9-lobed, the lobes 3 to 5-toothed; heads large, showy; flowers dark-purple, cream-tipped; beak of keel long apiculate.

Mendocino Co. and Pacific Grove. Rare. Forma *ROSTRATUM* McDer. Dwarf, about 4 in. high; leaflets small, obcordate, on long filiform petioles; involucre 4-lobed, each lobe 3 to 4-toothed; heads small, few-flowered; keel rostrate.—Marin and Alameda cos. (*T. rostratum* Greene.) May-June.

7. *T. variegatum* Nutt. WHITE-TIP CLOVER. Strictly glabrous, decumbent

or ascending, $\frac{2}{3}$ to $1\frac{1}{3}$ ft. high; stems slender; stipules ovate, laciniately toothed; leaflets very small to large, obovate to oblong-lanceolate; peduncles slender; heads small, few to many-flowered; involucre much smaller, 4 to 12-lobed, the lobes 3 to 7-toothed; flowers small, purple, white-tipped or purple throughout; calyx 5 to 20-nerved, its teeth subulate-setaceous, simple or one tooth bifid.

Widely distributed and common throughout California. Var. *PAUCIFLORUM* McDer. Dwarf, caespitose or stems short and slender; leaflets very small; heads of 1 to 7 small purplish flowers; involucre 1 to 4-lobed, the lobes 3 to 5-toothed.—Mendocino, Marin and Monterey cos.; also in the Sierra Nevada. The smallest clover of western North America (*T. pauciflorum* Nutt.) Var. *TRILOBATUM* Jepson. Slender, 4 to 8 in. high, sparsely branched at the base; margin of stipules laciniate; petioles slender, $1\frac{1}{2}$ to 2 in. long; leaflets lanceolate, acute at each end or often remarkably trilobate at apex; heads on long slender peduncles; lobes of involucre deeply and laciniately toothed; flowers long, dark purple, cream color at the tips; calyx-teeth slender, acute, generally purple-tipped; pod 2-seeded.—A beautiful but rare variety collected at the Marysville Buttes (*T. trilobatum* Jepson). Var. *MELANANTHUM* Greene. Leaflets large, oblanceolate, obtuse; heads large-flowered, showy; involucre small; calyx-teeth pungent and purple-tipped.—Common in low moist places, attaining a most luxuriant growth. Var. *MELANANTHUM* forma *MAJOR* McDer. A large stout and fistulous form; leaflets large, acute at each end; heads large; petals purple, white-tipped.—Common in low moist places, especially luxuriant in the Bay region.

T. POLYODON Greene. Glabrous, somewhat decumbent; stems flaccid, 1 to $1\frac{1}{2}$ ft. high; stipules laciniate, the margins reflexed; leaflets rhombic, entire to serrulate; involucre not deeply lobed, each lobe many-toothed; heads 5 lines in diameter; flowers dull purple fading to white at the top; calyx turbinate, 10-nerved, reticulate, all the teeth tridentate or multifid; pod 2-seeded; seeds brown-speckled.—Distinctly local. Pacific Grove; Monterey.

8. *T. oliganthum* Steud. Slender, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high; herbage glabrous, light green; leaflets linear to cuneate-oblong, serrate-setate to entire; heads very small, 3 to 15-flowered; involucre much smaller, divisions deeply lacinate and unequal; flowers small, lavender, white-tipped; keel purple; calyx-teeth broadly subulate; pod 2 to 3-seeded.

Wooded cañons and brush-covered slopes of the Coast Ranges. Limited in range. Not common. Forma *SONOMENSE* McDer. Stipules and involucre sparsely short pubescent.—Knights Valley, Sonoma Co. Var. *TRICHOCALYX* McDer. Peduncles and heads covered with a white pubescence; leaflets obovate or rhombic, $1\frac{1}{2}$ to 5 lines wide, 2 to 8 lines long.—Pacific Grove (*T. trichocalyx* Heller).

9. *T. microdon* H. & A. Stems stout, erect, $\frac{1}{2}$ to 2 ft. high, the secondary branches slender, covered with inconspicuous hairs; leaflets broadly obovate or oblanceolate, serrate-setate, 5 to 9 lines long; stipules ovate-lanceolate; involucre deeply campanulate, becoming flattened at anthesis, 5 to 15-lobed; lobes prominent, green, 3 to 7-toothed; flowers small, white or turning light pink; calyx-teeth short, abruptly subulate; pod 1-seeded.

Very common throughout our region. Apr.-May.

10. *T. barbigerum* Torr. Procumbent, 4 to 8 in. long; stems several from the base, spreading in a circle; peduncles erect, slender, wiry, pubescent to glabrous; stipules scarious, ovate-lanceolate, upper portion green; leaflets rhombic or deltoid to ovate-oblong, the margin setate; heads numerous, the

large involucre almost enclosing the flowers; calyx surpassing the corolla, its teeth plumose, setaceous, 2 teeth once or twice forked; flowers rose-red, banner inflated; pod 2-seeded.

Ridges of the foothills but not common. Var. *ANDREWSII* Gray. Villous pubescent throughout, less procumbent and larger than the species; heads large; involucre villous pubescent on both surfaces, 10 to 16-lobed, the lobes flabellate; flowers large, purple or lilac, the showy corollas much longer than the calyx.—Near the coast from Mendocino to San Luis Obispo. Rare.

11. *T. cyathiferum* Lindl. Strictly glabrous, 8 to 12 in. long, slightly decumbent; stipules broadly lanceolate; involucre bowl-shaped, the scalloped margin unequally toothed; flowers small, white or light pink, soon turning brown; calyx-teeth remarkably forked, in all 11 to 17 forking at the top.

Mendocino Co. and the Sierra Nevada, north to British Columbia.

12. *T. microcephalum* Pursh. Canescently pubescent or nearly glabrous, slender, ascending $\frac{1}{3}$ to 2 ft. high; stipules ovate, acuminate; leaflets obcordate to oblanceolate-retuse, serrate; involucre 7 to 10-lobed, the lobes lanceolate, entire with scarious web-like margins; heads small, compact; flowers small, light pink or white; calyx shorter than corolla; teeth simple, pungent, the margin scarious; pod 1 or 2-seeded.

Hillsides and valleys; common. Mar.-May.

13. *T. ciliatum* Nutt. Glabrous throughout, 1 to 2 ft. high, stout, fistulous; stipules large, ovate-lanceolate, the margins scarious; leaflets large, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, elliptic or oblong, obtuse, entire to serrulate; heads conical in flower, reflexed in fruit; flowers pinkish purple; calyx-teeth remarkably ciliate; banner inflated at base, tapering toward the apex; pod 1 to 2-seeded.—(*Trifolium ciliolatum* Benth.)

Plains and valleys throughout California; Sierra Nevada to about 5000 ft. Apr.-June.

14. *T. gracilentum* T. & G. PIN-POINT CLOVER. Glabrous, erect to procumbent, or spreading; stems slender, $\frac{2}{3}$ to $1\frac{1}{2}$ ft. long; stipules ovate-lanceolate; heads numerous, small, 5 lines long or less, reflexed in fruit, the rachis projecting; calyx-teeth subulate, entire, shorter than the corolla; pod 1 to 2-seeded.

Very common throughout the coast counties. Var. *INCONSPICUUM* Fern. Smaller but like the species in habit; stems 4 in. high or less; flowers light purple to white; banner broader.—Common throughout western California. Leaves exhibit a variety of beautiful colorings, from tiny white spots to red, brown and purple.

T. BREWERI Wats. Plant pubescent, glaucous throughout; stems slender, diffusely spreading; leaflets spatulate, obovate or ovate, coarsely dentate; heads small, loose; flowers pedicellate, cream-white, in loose heads.—Abundant in the Sierra Nevada; found occasionally in the Sacramento Valley.

15. *T. bifidum* Gray. Erect, very slender; stipules ovate-lanceolate, setaceously acuminate, entire; leaflets remarkably bifid $\frac{1}{4}$ to $\frac{1}{2}$ their length, often with a prominent mucro in the notch, the lobes coarsely toothed at apex; peduncles pubescent at base of heads; heads small, in age reflexed; flowers purple or light pink; calyx pubescent; banner characteristically patterned by the peculiar venation.

Coast Range hills, infrequent in the typical form. Var. *DECIPIENS* Greene. A leaf variety, leaflets linear-cuneate to obovate, entire or slightly emarginate at apex.—More common than the species; widely distributed.

16. **T. repens** L. WHITE CLOVER. Glabrous, stems erect or spreading from stoloniferous roots; leaflets broadly obovate, ovate or orbicular; stipules ovate-lanceolate, acute; heads globose, completely reflexed in fruit; flowers white; calyx-teeth short, subulate, entire.

Native of Europe, an escape from gardens.

17. **T. hybridum** L. ALSIKE CLOVER. Sparsely, pubescent, stems short, 4 to 8 in. high; leaflets large, ovate to orbicular; flowers light pink, the pedicels pubescent; calyx sparsely pubescent with appressed hairs.

Closely related to *T. repens* but a much stouter plant. An escape from gardens.

18. **T. pratense** L. RED CLOVER. Sparsely pubescent, branching at the base, $\frac{1}{2}$ to 2 ft. high; petioles short, the leaves subtending the head sessile; leaflets large, ovate to elliptic, entire to crenulate; heads large, conical; flowers deep pink or red; calyx-tube characteristically nerved at the base of teeth; pod 2-seeded.

Native of Europe. Naturalized in low valleys and met with occasionally along obscure mountain passes.

19. **T. albopurpureum** T. & G. Slender, ascending or slightly decumbent, $\frac{3}{4}$ to $1\frac{1}{3}$ ft. high; heads hemispherical, small, the terminal single, on long peduncles, the lateral on short peduncles; leaflets cuneate-oblong, obtuse; flowers dark purple; corolla slightly longer than the calyx-teeth; pod 1 to 2-seeded.

Common in the Coast Ranges, very variable. Var. *NEOLAGOPUS* McDer. Ascending, stems rigid; heads 5 lines wide, 10 lines long, in conical spikes; corolla dark purple, as long as the calyx: Coast Ranges. Var. *NEOLAGOPUS* forma *ARGILLORUM* Jepson. Stems rigid, $\frac{1}{2}$ to 1 ft. long; heads oblong, cylindrical, on very long peduncles; calyx exceeding the corolla.—Dry hills of the North Coast Ranges. The entire plant has a dusty appearance (var. *argillorum* Jepson).

20. **T. macraei** H. & A. Somewhat decumbent or spreading, much branched at the base, softly pubescent throughout; stems stout, often wiry, 4 to 12 in. high; heads sessile in pairs, subtended by the stipules and sessile leaves; flowers purple; corolla as long or longer than the plumose calyx.

Along the coast: Monterey; San Francisco; Pt. Reyes. Closely related to the last but not as common. May-June.

21. **T. dichotomum** H. & A. Tall and stout, dichotomously branched above, simple or twice branched at the base, $\frac{1}{3}$ to 2 ft. high; leaflets very large, elliptical, rhomboid or ovate, densely pubescent; heads large, globose, $\frac{3}{4}$ to $1\frac{1}{4}$ in. in diameter; flowers purple, white-tipped; calyx densely pubescent, shorter than the corolla; pod 2-seeded.—(*T. amoenum* Greene.)

Valleys from Elmira southwesterly to Napa Junction, Olema and Bodega. A handsome but rare species, abundant some seasons, disappearing other seasons. May-June. Dr. Jepson compared material with the type at Kew, England. Forma *PETROPHILUM* McDer. Smaller, the stems and entire plant more slender than the species; heads globose, 5 lines long or less; mature flowers longer than the calices.—Rocky summits from Napa to Santa Clara Co. Not abundant (*T. petrophilum* Heller).

22. **T. olivaceum** Greene. Ascending, 8 to 12 in. high, glaucous throughout; peduncles stout; leaflets cuneate-obovate; heads ovate-truncate; flowers completely hidden by the long and pubescent calyx-teeth; calyx-tube 1 to $1\frac{1}{2}$ lines long, conspicuous at the base of the heads; pod glabrous, 1-seeded.

Low hills of Solano and Sonoma cos. Apr.-May. Forma *COLUMBINUM* McDer. Leaflets larger, apex obtuse; heads longer than broad, the long calyx-teeth completely obscuring the small corollas; calyx-tube $\frac{1}{2}$ line long, inconspicuous; pod pubescent.—Rare, not found some seasons, perhaps of hybrid origin. Collected only in middle western California (*T. columbinum* Greene).

23. *T. californicum* Jepson. Sparsely to densely pubescent, 1 to $1\frac{1}{2}$ ft. high; stipules small, ovate-acuminate; petioles slender; leaflets ovate to elliptical or cuneate-obovate, 5 to 14 lines long; heads cylindric, spike-like, truncate at top, turbinate at base; flowers short, rich purple, cream-tipped; corollas longer than the calices; pod 1-seeded.—(*T. dichotomum* Jepson not H. & A.)

A beautiful but local species, gregarious, covering patches a rod square, in the hills of the Coast Ranges. Forma *TURBINATUM* Jepson. Smaller than the species; heads turbinate, truncate, 5 lines long, 7 lines broad at the top; flowers purple, cream-tipped; corolla exceeding the calyx; pod 1 to 2-seeded.—Same range as the species. Apr.-May. (Var. *turbinatum* Jepson.)

8. LOTUS L.

Annual or perennial herbs, some slightly suffrutescent. Leaves pinnate, of 1 to many leaflets, with foliaceous, scarious, or gland-like stipules. Flowers in terminal or axillary umbels, or solitary and axillary. Corolla yellow, reddish or whitish, sometimes pink-tinged or marked with purple. Calyx-teeth nearly equal. Stamens diadelphous, free from the petals; anthers all alike. Style incurved. Pod flattened or terete, sessile, 2 to commonly several-seeded, often septate between the seeds, dehiscent or indehiscent. (A Greek name.)

A. Pods dehiscent.

Flowers and pods erect or somewhat diverging, at least not reflexed.

Stipules large, foliaceous or scarious; leaflets mostly equally distributed on the opposite sides of the rachis; pods linear-elongated and straight, tardily dehiscent; perennials.

Stoutish; bract borne somewhat below the umbel; claws of the petals sometimes obviously exerted from the calyx.

Glandular-hispidulous and viscid; leaflets 11 to 21, thinnish.....1. *L. stipularis*.

Nearly glabrous, glaucous, not viscid; leaflets 9 to 11, thick....2. *L. crassifolius*.

Slender; bracts borne at the umbel; claws of the petals conspicuously exerted from the calyx; banner yellow.

Puberulent; wings white.....3. *L. torreyi*.

Glabrous; wings pink or rose-color.....4. *L. formosissimus*.

Stipules gland-like; leaflets commonly unequally distributed on the opposite sides of the rachis; pods readily dehiscent.

Flowers many in a capitate umbel; leaflets 3 to 9; perennial.

Tall, 1 to 5 ft. high; flowers yellow, turning orange.....5. *L. grandiflorus*.

Low, the branches half-prostrate or ascending, as much as 18 in. long, but seldom over 5 or 6 in. high; flowers yellowish white, turning red-purple.....

6. *L. leucophaeus*.

Flowers 1 to several, on an elongated bracted peduncle; rachis (except in nos. 9 and 10) conspicuously dilated; annuals.

Peduncle 2 to 5-flowered; keel obtuse; leaflets commonly 7.....7. *L. salsuginosus*.

Peduncle 1 or 2-flowered; keel obtuse; leaflets 5 to 9.....8. *L. strigosus*.

Peduncle 1-flowered; keel acute; leaflets 1 to 5.

Corolla twice as long as the calyx; pods constricted between the seeds; leaflets mostly 3 or 4; herbage glabrous.....9. *L. micranthus*.

Corolla scarcely exceeding the calyx; pods not constricted; leaflets 1 to 4, mostly 3; herbage villous-pubescent.....10. *L. americanus*.

Flowers solitary, short-pedicelled, not bracted; keel acutely beaked; corolla much exceeding the calyx; annuals.

Calyx-teeth linear, much longer than the tube; pods oblong, 2 or 3-seeded.....

11. *L. humistratus*.

Calyx-teeth equaling the tube; pods linear, 5 to 7-seeded.....12. *L. subpinnatus*.

B. Pods indehiscent.

Flowers and pods reflexed; umbels short-peduncled or sessile; leaflets 3 to 5, rarely 6; stipules gland-like; pods long-pointed and often arcuate, 1 or 2-seeded; claws of the petals sometimes obviously exerted from the calyx-tube.

Annuals, mostly prostrate; leaflets 5 to 7.

Calyx hirsute with whitish hairs; stems much branched.....13. *L. heermannii*.

Calyx densely tawny-villous; stems simple.....14. *L. eriophorus*.

Perennials.

Umbels sessile; calyx-teeth subulate, erect; leaflets mostly 3; tufted and reedy-looking plant, the foliage scant.....15. *L. glaber*.

Umbels peduncled.

Calyx-teeth subulate, recurved; habit and leaves similar to the last.....

16. *L. benthamii*.

Calyx-teeth triangular, blunt; leaflets usually 4.....17. *L. biolettii*.

1. ***L. stipularis*** (Benth.) Greene. Erect, $1\frac{1}{2}$ to 2 ft. high; herbage glandular-hispidulous and glutinous; leaflets 11 to 21, obovate- or elliptic-oblong, obtuse or acute, mucronate, $\frac{1}{2}$ to 1 in. long; stipules large, ovate-acuminate; peduncles much shorter than the leaves, 5 to 10-flowered, with 3-foliolate petioled leaf-bract near the umbel; corolla whitish or yellowish, with purple marks, 5 lines long, the calyx rather more than $\frac{1}{2}$ as long, its teeth broadly subulate, $\frac{1}{3}$ as long as the tube; pod not known to us.—(*Hosackia stipularis* Benth. *H. balsamifera* Kell.)

Sonoma to Alameda cos. and Monterey.

2. ***L. crassifolius*** (Benth.) Greene. Erect, stout, glaucous (or seemingly so) and somewhat pubescent; stems often clustered, 2 to 3 or 5 ft. high; branches comparatively few, often flexuous; leaves 4 in. long or more; leaflets 9 to 11, occasionally 8 or 12, sometimes inequilaterally distributed, elliptic or slightly rhomboidal, almost coriaceous, 10 to 12 lines long, on petiolules often 1 line long; stipules ovate or roundish, scarious; peduncles shorter than the leaves, bracted above the middle with a 3-foliolate petioled leaf and bearing an umbel of 7 to 12 flowers on slender pedicels; calyx $2\frac{1}{2}$ lines long, with very short acute teeth; corolla greenish yellow or whitish, marked with purplish spots, twice as long as the calyx, which is scarious in fruit; pods terete, 2 to $2\frac{1}{2}$ in. long, 2 to 3 lines in diameter, 7 to 12-seeded; seeds nearly 2 lines long.—(*Hosackia crassifolia* Benth.)

Mountainous country, in dry places. Coast Ranges, towards the interior: Mt. Diablo, Vaca Mts., etc. Mt. Shasta. Sierra Nevada. June-July.

3. ***L. torreyi*** (Gray) Greene. Stems erect, slender, 1 or 2 ft. high; leaves with a fine indument; leaflets 7 to 9, obovate or oblong, 9 to 12 lines long; stipules triangular-lanceolate; peduncles longer than the leaves, 2 to 6 in. long; umbels 7 to 9-flowered, the 1-foliolate bract 3 to 6 lines long; flowers nearly $\frac{1}{2}$ in. long; claws of the petals exerted from the calyx (as also in the next); keel and wings white; keel obliquely incurved at apex; calyx-tube a line long, the subulate teeth nearly as long; pod slender, 1 to $1\frac{1}{2}$ in. long.—(*Hosackia torreyi* Gray.)

Along streamlets and in low moist meadows of the Coast Ranges. Also in the Sierra Nevada. June.

4. ***L. formosissimus*** Greene. Stems several from a soft and much thickened taproot, decumbent, 5 to 12 in. long; herbage glabrous, light green; leaflets 5 to 7 (or 8), the lower deltoid-obovate and truncate or retuse, the upper obovate-oblong, 4 to 6 lines long; peduncles 1 to $1\frac{1}{2}$ in. long; umbels 4 to 6-flowered, the bract 3-foliolate and petioled; flowers exceeding $\frac{1}{2}$ in. long; calyx 3 lines long, its teeth triangular-acuminate, $\frac{1}{3}$ as long as the tube; banner yellow, with an obvious upturned thickened process at base of blade on each

side; wings and keel pink-tinged, the keel yellow below; pod straight, $1\frac{1}{4}$ in. long, scarcely more than 1 line broad.—(*Hosackia gracilis* Benth.)

Common in moist ground along the seaboard: Monterey; Santa Cruz Mts.; Bolinas; Sonoma Co.; Mendocino. A beautiful species, flowering in Apr. Wings and keel turn blue in drying.

5. *L. grandiflorus* (Benth.) Greene. Tall and stout, 1 to 3 ft. high, appressed silky-pubescent or nearly glabrous; leaflets 5 to 7 or 8, on an elongated rachis, obovate to oblanceolate, acute, 6 to 9 lines long; peduncles elongated, bearing a 3 to 8-flowered umbel commonly subtended by a 1-foliolate bract; flowers nearly sessile, bright yellow, turning orange, 7 to 9 lines long; banner 4 lines broad; calyx-teeth broadly subulate; pod slender, $1\frac{1}{2}$ in. long, reddish brown, the margin of the valves with a whitish or callous line.—(*Hosackia grandiflora* Benth.)

Coast Range ridges from Mendocino Co. to Santa Monica.

6. *L. leucophaeus* Greene. Perennial, with pubescent or even velvety herbage, the stems from a woody subterranean base, diffusely spreading or ascending, 10 to 15 or 18 in. long; internodes short; leaves ample; leaflets mostly 6, elliptic and obtuse or for the most part obovate and shortly acute, 6 to 8 lines long; peduncles equaling or exceeding the leaves; umbel with a 1-foliolate bract, 5 to 8-flowered; flowers exceeding $\frac{1}{2}$ in., yellowish white, changing to red-purple; banner 3 lines broad; calyx 4 lines long, its lobes subulate-lanceolate, nearly as long as the tube; pod 1 in. long and 1 line wide.

High dry ridges: Mt. Diablo Range; Vaca Mts. June. Dubious species.

7. *L. salsuginosus* Greene. Minutely strigose-pubescent; stems ascending or prostrate, somewhat succulent, commonly much branched, 9 to 16 or often 24 in. long; leaflets 5 to mostly 7, elliptic or more commonly oblong-obovate, 3 to 7 lines long; peduncles 1 in. long or less, 2 to 5-flowered, bractless or with a conspicuous 1 to 3-foliolate bract; corolla yellow, 3 lines long, the banner sometimes shorter than the wings and obliquely obtuse keel; calyx-tube $\frac{1}{2}$ to $\frac{2}{3}$ as long as the linear-lanceolate teeth; pod 1 in. long, 10 to 12-seeded; seeds obliquely oval, smooth.—(*Hosackia maritima* Benth.)

Alkaline flats: San Jose; Santa Cruz; Monterey and southward to Southern California. Mar.-May.

8. *L. strigosus* (Nutt.) Greene. Appressed-hirsutulous; stems branched at the base and decumbent or prostrate; leaflets 7 to 10, oblong or narrowly obovate, 2 to 5 lines long; early peduncles shorter than the leaves, 1-flowered, bractless; later peduncles often longer than the leaves, frequently 2-flowered and bracted; flowers 3 or 4 lines long, yellow; calyx $\frac{1}{2}$ as long, its teeth triangular-acuminate; pod 1 in. long or somewhat less, 9 to 14-seeded; seeds quadrate, deeply notched at the hilum, minutely granulate, $\frac{1}{2}$ line long.—(*Hosackia rubella* Nutt.)

Alameda, San Francisco and southward. Apr.-Nov. Var. *NUDIFLORUS* Jepson, with pods $1\frac{1}{2}$ times as broad and slightly curved upward at apex and flowers 5 lines long, occurs in the Mt. Diablo Range.

9. *L. micranthus* Benth. Annual, glabrous and glaucous, the stems very slender, 1 or 2 from the base and erect, or rarely with many diffuse or ascending branches, 4 to 7 in. high; leaflets 3 to 5, mostly 4 with one leaflet terminal and two on one side of the rachis and one on the other, obovate to oblong, 2 to 5 lines long; peduncles filiform, shorter than the leaves, 1-flowered, bracted, 1 to 6 lines long, or in fruit as much as 1 in. long; flowers minute, pale salmon, turning red; corolla twice as long as the calyx, the teeth of the latter commonly

shorter than the tube; pod 7 to 10 lines long, linear, compressed, constricted between the oval or roundish smooth seeds.—(*Hosackia parviflora* Benth.)

Common in the Coast Ranges on grassy hills, the plants, where found, numerous and growing closely together: Napa Co.; Sonoma Co.; Mt. Tamalpais; Mt. Diablo and southward to Monterey and Southern California. Apr.-May.

10. *L. americanus* (Nutt.) Bisch. SPANISH CLOVER. Annual, more or less silky-villous or pilose-pubescent, strictly erect and nearly simple, or more commonly very diffusely branched with straggling or ascending stems 2 or 3 ft. long; leaflets 1 to mostly 3, ovate to oblong, acute or obtusish, 3 to 10 lines or the lower 1 in. or more long; peduncles exceeding the leaves, the solitary whitish or pinkish flower subtended by a bract 2 to 4 lines long; calyx-teeth subulate-linear, longer than the short tube, almost equaling the (2 to 3 lines long) corolla; pod narrowly linear, glabrous, about 1 in. long, 5 to 7-seeded; seeds oblong, smooth, dark colored.—(*Hosackia purshiana* Benth.)

Dry summer fields and open hills throughout California. July-Oct. Valued for forage.

11. *L. humistratus* Greene. HILL LOTUS. Herbage soft-villous, branches from the base decumbent, or ascending, or more often prostrate and forming mats 5 to 9 in. broad; leaflets 4, narrowly oblong or cuneate-obovate, 3 to 5 lines long, the rachis over $\frac{1}{2}$ line broad; flowers sessile, or nearly so, yellow, 3 or 4 lines long; calyx-teeth linear, much longer than the tube; wings at base of blade joined above ovary as in the next; pod oblong, pilose, 4 lines long, 2 or 3-seeded.—(*Hosackia brachycarpa* Benth.)

Abrupt sunny hillsides in clayey soil; Coast Ranges and Sierra Nevada. Less common than the next. May.

12. *L. subpinnatus* Lag. var. *wrangelianus* Jepson. Annual, low, diffusely branched, 4 to 7 in. high; herbage sparsely pubescent with short hairs, canescently villous, or nearly glabrous, especially on the upper surface of the leaflets; foliage similar to the preceding; flowers distinctly pediceled, bright yellow, 4 to $4\frac{1}{2}$ lines long; calyx-teeth broadly subulate, as long as the tube; wings joined on the upper side of the ovary by the lobes or processes at the base of the blade, their tips meeting above the keel, but not enfolding it; pod pubescent, linear, 7 to 9 lines long, 5 to 7-seeded.—(*L. wrangelianus* F. & M.)

Common in the hill country of the Coast Ranges, south to Southern California and north to Washington. Apr.-May.

13. *L. heermannii* (Dur. & Hilg.) Greene. Very near the next, less pubescent, the pubescence whitish, the herbage of a light green; stems prostrate, several from the root, 2 to 3 ft. long, with long branches throughout their length; leaflets somewhat broader and more acute; flowers one-half as large; calyx hirsute with whitish hairs; corolla yellow turning to deep red.

Santa Cruz Mts. and southward to Tejon Pass and Southern California.

14. *L. eriophorus* Greene. Annual, villous-pubescent or somewhat tomentose; stems numerous from the base, simple, often prostrate and almost matting the ground, about 1 ft. long; leaflets 5 to 7, obovate and often cuneate to cuneate-oblong, mostly acutish and mucronulate, 3 to 5 lines long; umbels 5 to 7-flowered, nearly sessile; flowers yellow, turning brownish, $3\frac{1}{2}$ lines long; calyx $\frac{1}{2}$ as long, very densely villous and tawny, the filiform teeth about equaling the tube; body of pod 2 or 3 lines long, the long-pointed portion as

long.—(*Hosackia tomentosa* and *H. heermannii* Brew. & Wats., Bot. Cal. as to San Francisco Co.)

San Francisco and southward along the coast. Apr.-Sept. Stems pilose, in the next comparatively glabrous.

15. *L. glaber* (Vogel) Greene. DEER-WEED. Stems woody at base, tufted and reed-like on account of the sparse foliage, 2 to 5 ft. high, erect with straggling branches or sometimes decumbent; herbage very nearly glabrous, the calyx and young leaves often somewhat appressed-silky; leaflets mostly 3, on young shoots 4 to 6, oblong to linear-oblong, 3 to 6 lines long, obtuse or acute; umbels numerous, sessile; flowers yellow, turning red, 3 or 4 lines long; calyx about 2 lines long, its teeth subulate, erect, about $\frac{1}{2}$ as long as the tube.—(*Hosackia glabra* Torr.)

Common everywhere in the hill country of the Coast Ranges and southward to Southern California. Esteemed as a bee-plant in the southern part of the State and also called Deer-clover, Wild Broom and Wild Alfalfa. While abundant in most seasons and blooming from June to Sept., in some years it dies out as the plants are said to live only two or three years.

16. *L. benthamii* Greene. Similar to the preceding; umbels on peduncles equaling or exceeding the leaves, usually 1 to 3-foliolate bracted; calyx-teeth subulate, sometimes recurved.—(*Hosackia cytisoides* Benth.)

San Francisco and southward to Monterey and the Salinas Valley.

17. *L. biolettii* Greene. Herbage ashy or whitish with short appressed hairs; branches slender, wiry and prostrate, 1 to 2 ft. long; leaflets usually 4, cuneate-obovate, obtuse, 2 to 5 lines long; peduncles scarcely surpassing the leaves, the umbel 6 to 10-flowered and 1-foliolate bracted; calyx a line long or less, the triangular blunt teeth erect; corolla 2 lines long, yellow, changing to dark red; pod strongly arcuate, slender beaked.

Dry ridges, Marin Co.

9. AMORPHA L.

Deciduous shrubs with pellucid-glandular heavy-scented herbage. Leaves odd-pinnate, with caducous stipules and stipels. Flowers small, violet or purple, in long and narrow terminal spikes. Calyx obovate, 5-toothed, persistent. Petals wanting except the banner, this erect, concave, clawed. Stamens 10, monadelphous at the very base, otherwise distinct. Pod short, but exceeding the calyx, 1 or 2-seeded, tardily dehiscent. (Greek *amorphos*, deformed, alluding to the corolla.)

1. *A. californica* Nutt. Four to 7 ft. high; leaflets 11 to 27, oblong-elliptical, mucronulate at the retuse apex, shortly petioled, 7 to 12 lines long; rachis pubescent and with prickly-like glands scattered among the sessile ones, often becoming glabrous late in the season; stipules and bracts lanceolate, deciduous; racemes 2 to 4 in. long; flowers about 3 lines long; calyx with short teeth; banner dark purple, truncate or notched; stamens longer than banner; pod $2\frac{1}{2}$ lines long, with many low circular glands which are depressed or somewhat excavated in the center.—(*A. hispidula* Greene.)

Wooded cañons: Pope and Napa valleys to Mt. Tamalpais and southward near the coast to Southern California. May.

10. PSORALEA L.

Ours perennial herbs. Herbage heavy-scented, punctate with dark dots. Leaves 3 or 5-foliolate; stipules free from the petiole. Flowers purple or whitish in spikes or racemes. Calyx 5-cleft, its lobes nearly equal. Keel

broad, obtuse, joined to the wings. Stamens monadelphous or diadelphous; anthers uniform. Pod seldom exceeding the calyx, 1-seeded, indehiscent. (Greek psoraleos, scurfy or rough, the glands wart-like in some species.)

Leaves pinnate with 3 leaflets.

Stems prostrate; leaves and peduncles erect; flowers racemose; stamens diadelphous....
1. *P. orbicularis*.

Erect plants.

Flowers in spikes, purple.

Peduncles shorter than the leaves; stamens monadelphous.....2. *P. strobilina*.

Peduncles much surpassing the leaves; tenth stamen nearly free.

More or less pubescent; calyx-teeth exceeding the petals....3. *P. macrostachya*.

Nearly glabrous but for the elevated roundish glands on the stem; calyx-teeth shorter than the petals.....4. *P. douglasii*.

Flowers in racemes, greenish white; stamens monadelphous.....5. *P. physodes*.

Leaves palmate with 5 leaflets.....6. *P. californica*.

1. *P. orbicularis* Lindl. Stems prostrate, creeping and rooting, the long-stalked leaves and the often long peduncles erect; herbage finely pubescent, the inflorescence villous; leaflets $2\frac{1}{2}$ to 3 in. long, the lateral pair obovate, the middle one more nearly orbicular; petioles 6 to 15 in. long; spikes varying from 3 to 10 in. long, borne on peduncles which equal or exceed the leaves; flowers 6 lines long; calyx with stipitate glands scattered among the hairs, cleft almost to the base, the lowest tooth as long as the purplish corolla; pod ovate, acute, 3 lines long.

Grassy vales or meadows near the coast from Monterey to Santa Clara, *Hinds*, 1837, Marin Co. and Pt. Arena; southward to Southern California, northward ranging towards the interior (Howell Mt., Mt. Shasta), but only at considerable altitudes. June.

2. *P. strobilina* H. & A. Erect, 2 or 3 ft. high, villous throughout and glandular-pubescent on the branches, peduncles and petioles; leaflets orbicular to rhombic-ovate, more glabrous above, 2 in. long; stipules large, membranous, acuminate; peduncles shorter than the leaves; spikes short-oblong, the bracts very large, deciduous; calyx 6 lines long or more, the lower tooth much the longest and equaling the purple corolla; stamens monadelphous; ovary pubescent.

Hill country from Contra Costa and Alameda cos. to Santa Cruz. Seldom collected.

3. *P. macrostachya* DC. LEATHER ROOT. Stems erect, 4 or 5 or even 8 or 10 ft. high; herbage variable, nearly glabrous, villous-pubescent or tomentose; leaflets ovate-lanceolate, truncate to acute at base, $1\frac{1}{2}$ to 3 in. long; peduncles very much exceeding the leaves; spikes broadly cylindrical, silky-villous with white hairs; bracts broad, acuminate, as long as the flowers; calyx 3 to 5 lines long, the lower tooth a little the longest, exceeding or equaling the purple petals, the 4 upper teeth short, broadly lanceolate; corolla blue, the lower portion of banner dull greenish; tenth stamen nearly free; pod hairy, ovate-oblong, acute, flattened, 3 or 4 lines long.

Along rivers and larger streams in the valleys, following the cañon bottoms in the mountains, and common in the salt marshes, always in the richest soils. The most common and widely distributed species of the genus, occurring both in the Coast Ranges and Sierra Nevada foothills. Roots furnishing to the Pomos and other native tribes a very tough fibre.

4. *P. douglasii* Greene. Habit of the preceding, but more slender, nearly glabrous, the stem, and often the petioles, sprinkled with elevated dot-like glands; leaflets rhombic-ovate, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long; racemes narrower than in the last, 2 to 3 in. long, on slender peduncles 3 or 4 in. long; bracts deltoid

and long-acuminate, caducous; rachis and calyx densely short-villous, the hairs often blackish, the segments of the latter just shorter than the violet corolla.

Apparently not common. Santa Clara Co. to Marin Co. Aug.-Sept.

5. *P. physodes* Dougl. Low, mostly but 1 ft. high, nearly glabrous; leaflets ovate, varying to orbicular, mostly acute, 1 to 2 in. long; peduncles shorter than the leaves or exceeding them; racemes short, dense, the bracts small; calyx cup-shaped, covered with glands which suggest low volcanic craters, and slightly villous with usually dark hairs, rather more than $\frac{1}{2}$ as long as the corolla, at length much enlarged and inflated; calyx-teeth very short and subequal; corolla 5 to 6 lines long; petals greenish white, the keel purple-tipped; pod roundish, compressed, 3 lines long.

Common in open spots on bushy or wooded slopes of the higher hills or mountains: Monterey to Mt. Diablo, Marin Co., Napa Range, Vaca Mts. and northward. Apr.-June. Makes a very pleasant tea when dried, and was used as such by early Californians, who called it "Native California Tea" (Mrs. Maud Wheeler, Sebastopol).

6. *P. californica* Wats. Low and tufted, the stems many from a woody often branched caudex; pubescence silky and appressed; leaves palmately compound; leaflets 5, orbicular-obovate and cuneate at base, 7 or 8 lines long; stipules scarious, lanceolate; racemes shorter than the leaves, dense, rather less than 1 in. long, on short peduncles; calyx silky-villous, 6 lines long, the linear-acuminate lobes a little exceeding the petals; pod oblong, narrowed to a lanceolate beak, thin-walled, villous; seed dark brown, 2 lines long or more.

A rare plant: summit of Mt. Diablo (the only known locality within our limits); headwaters of the Salinas, *Palmer*. May-July.

11. GLYCYRRHIZA L. LIQUORICE.

Perennial herbs with glandular-viscid herbage, odd-pinnate leaves and minute stipules. Flowers yellowish white, in axillary peduncled spikes. Calyx 5-cleft, with the 2 upper lobes shorter or partly united. Stamens monadelphous or diadelphous, the alternate anthers smaller. Ovary 2 to many-ovuled; style short and rigid, curved at the tip. Pod short, flattened, prickly, few-seeded, indehiscent. (Greek glukus, sweet, and rhiza, root.)

1. *G. lepidota* Nutt. var. *glutinosa* Wats. Stems erect, 2 ft. high; herbage viscid-puberulent and sometimes with minute scales; leaflets 11 to 15, oblong- to ovate-lanceolate, 1 to $1\frac{1}{2}$ in. long; stipules persistent; spikes broadly oblong, exceeding 1 in., the peduncles $\frac{3}{4}$ to 3 in. long, with spreading glandular hairs; flowers yellowish white; calyx very glandular; pod oblong, $\frac{1}{2}$ in. long, reddish brown, bur-like, beset with hooked prickles, 2 to 6-seeded.

Rich soil of low or moist lands in the valleys or on the plains: Solano and Sonoma cos. to Alameda and Santa Clara cos. and southward to Southern California. June.

12. ASTRAGALUS L. RATTLE-WEED. LOCO-WEED.

Herbs with odd-pinnate leaves. Flowers purple, pale yellow or white, in spikes, racemes or heads. Racemes mostly spike-like, either the pedicels very short or the flowers crowded. Calyx 5-toothed. Corolla usually long and narrow; keel obtuse. Stamens diadelphous; anthers all alike. Pod 2 to many-seeded, commonly turgid or inflated and bladder-like, 1-celled or partly 2-celled by the intrusion of one or both sutures, tardily dehiscent. Seeds small, usually reniform on slender funiculi. (Ancient Greek name for some leguminous plant.)

A. Annuals.

Pods didymous, wrinkled, 2-seeded.

Spikes capitate or oblong; pods erect, little exserted from the calyx. 1. *A. didymocarpus*.

Spikes cylindrical; pods deflexed, well exserted from the calyx. 2. *A. nigrescens*.

Pods not didymous, nor wrinkled, several-seeded; inflorescence capitate.

Pods narrowly oblong, not beaked. 3. *A. tener*.

Pods with a stout body and long incurved beak. 4. *A. breweri*.

B. Perennials; pods 1-celled except no. 11.

Pods inflated or bladder-like and

stipitate.

Stipe long and filiform; leaflets 21 to 31. 5. *A. leucophyllus*.

Stipe recurved, little exceeding the calyx; leaflets 9 to 21. 6. *A. oxyphissus*.

Sessile in the calyx.

Peduncles mostly longer than the leaves; flowers spreading or deflexed.

Flowers white; stipules distinct. 7. *A. crotalariae*.

Flowers yellowish white or greenish; stipules mostly united opposite the petiole;

raceme often long. 8. *A. menziesii*.

Peduncles shorter than the leaves; flowers mostly erect, yellow or creamish; stipules distinct; raceme short. 9. *A. douglasii*.

Pods not inflated.

Herbage hoary; racemes dense, $1\frac{1}{4}$ to 2 in. long; pods crowded, retrorsely imbricated, 4 lines long. 10. *A. pycnostachys*.

Herbage nearly glabrous; racemes loose, 3 to 6 in. long; pods deflexed, $2\frac{1}{2}$ lines long. 11. *A. clevelandii*.

1. ***A. didymocarpus*** H. & A. Slender, 3 to 10 in. high, pubescent; leaflets 9 to 15, narrowly oblong to linear and more or less cuneate, sharply notched at apex, 3 to 5 lines long; spikes dense, capitate or oblong, 4 to 6 lines long, on long peduncles; flowers $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, dull purplish; calyx rather densely hirsute with black hairs; pod with a minute short scattered pubescence, erect, 2 lines long and about as broad, scarcely exserted from the calyx, strongly nerved transversely, so deeply 2-lobed lengthwise as to be divided into 2 cells, the fruit therefore twin-like with 1 large seed in each cell.

Low hills: Antioch and Kirker Pass southeastward to the head of the San Joaquin Valley and westward to San Luis Obispo Co. Apr.

2. ***A. nigrescens*** Nutt. Smaller and more slender than the last and less pubescent; flowers dull and commonly minute but sometimes large; fruiting spikes cylindrical, much less dense, 3 to 10 lines long; pods deflexed, well exserted from the calyx, hirsute-pubescent, wrinkled and strongly obcompressed.—(*A. elmeri* Greene.)

Vaca Mts.; Mt. St. Helena; Mt. Diablo; Berkeley; Marin Co. and southward to Southern California. Also in the Sierra Nevada foothills. Apr.

3. ***A. tener*** Gray. Slender, 4 to 9 in. high, minutely pubescent; leaflets 9 to 15, linear or cuneate, either acute or emarginate at apex; inflorescence capitate, the head 5 to 9-flowered; flowers purple and white, 5 lines long; calyx with minute and short appressed brown hairs; pod silvery when young, glabrous when mature, coriaceous, narrowly oblong, 8 lines long, somewhat incurved, 2-celled, 5 to 10-seeded; fruiting peduncle 2 in. long, at length spreading, declined or even reflexed.

Alkaline fields, mostly in moist places: Solano to Alameda cos. May.

4. ***A. breweri*** Gray. Much like the preceding but smaller, relatively stouter and the leaflets broader; heads 5 to 7-flowered; pod 1-celled or nearly so, the body short with a long incurved beak.

Sonoma Valley to Mt. Tamalpais.

5. ***A. leucophyllus*** T. & G. Stem erect, stoutish, 2 or 3 ft. high, the growing parts silvery-canescens, glabrate and greenish in age; leaflets 21 to 31, narrowly oblong or linear, 6 to 10 lines long; raceme densely flowered and long-peduncled; flowers 6 to 8 lines long; calyx-teeth subulate, about $\frac{1}{2}$ the

length of the oblong tube; corolla yellowish white; pod obliquely oval, thin, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long, on a filiform pubescent stipe of almost equal length.

Low dry hills: inner North Coast Range to the Livermore Pass and westward to Niles Cañon.

6. *A. oxyphysus* Gray. Habit of the preceding; growing parts canescent, becoming green but not glabrous; leaflets 9 to 21, oblong, $1\frac{1}{4}$ in. long or less, the lower as much as 5 lines wide; peduncle much exceeding the leaves, bearing an elongated densely flowered raceme; corolla greenish white, 8 lines long; pod $1\frac{1}{2}$ in. long, clavate-obovate, oblique, acuminate at apex, strongly contracted at base into the recurved stipe which exceeds the calyx.

Dry hills in the Mt. Hamilton Range at Arroyo del Puerto.

7. *A. crotalariae* (Benth.) Gray. Glabrous, except the pubescent growing parts; stems stout, decumbent; leaflets 21 to 35, linear-oblong to broadly obovate, retuse or obtuse, thickish, 5 to 12 lines long; stipules triangular-subulate, distinct; racemes 4 to 10 in. long; calyx-teeth broadly subulate, one-half as long as the short-campanulate tube; corolla white, 6 lines long; pod almost papery, much inflated, ovoid, 1 to $1\frac{1}{2}$ in. in length.

San Francisco to Southern California. May.

8. *A. menziesii* Gray. Plant stout, erect, 2 to 4 ft. high; young herbage whitish pubescent, soon green, but hirsute-pubescent; leaflets 21 to 43, commonly crowded on the rachis, broadly oblong, less frequently cuneate-obovate or narrowly ovate, usually retuse at apex, 5 to 8 lines long; stipules broad, not pointed, all but the uppermost continued around the stem and nearly meeting or even united on the side opposite the leaf; corolla 4 to 6 lines long, yellowish white or greenish, the keel purple-tipped; raceme short and dense ($1\frac{1}{2}$ in. long), or longer and loose; peduncles 3 to 6 in. long; pod thin-walled, 1 to 2 in. long, otherwise similar to the preceding.

Sandy soils near the coast: San Francisco and Alameda to Monterey and southward. June-Aug.

9. *A. douglasii* (T. & G.) Gray. Stems ascending, 1 ft. high; herbage cinereous when young, almost glabrous in age; leaflets numerous, linear to oblong, 4 to 9 lines long; stipules mostly subulate; peduncle shorter than the leaves, bearing a dense 10 to 20-flowered raceme; calyx-teeth subulate, shorter than the campanulate tube; corolla scarcely twice the length of the calyx, 4 lines long, yellow or creamish; pod thin-walled, obliquely ovoid, $1\frac{1}{2}$ to 2 in. long.

Gravelly stream-beds: San Benito River and southward in the Coast Ranges.

10. *A. pycnostachys* Gray. Stems stoutish, 1 to 3 ft. high; herbage more or less villous-hoary; leaflets numerous (about 18 or 19 pairs), linear to oblong; flowers whitish or the wings faint yellow, 4 to 5 lines long, numerous in a dense oblong or cylindrical spike-like raceme $1\frac{1}{4}$ to 2 in. long; peduncle slightly exceeding raceme; pods crowded, retrorsely imbricated, ovate, narrowed at apex into the persistent and prominent style, somewhat flattened laterally and margined by the prominent sutures, 1-celled, the wall thin and reticulated; body of pod 3 or 4 lines long; seeds 1 to 3.

Salt marshes or about springy places in cañons opening to the sea: Pt. Reyes south to San Mateo Co. (Tunitas Creek, *Jepson.*) June-July.

11. *A. clevelandii* Greene. Stems slender, erect, 2 to 3 ft. high; herbage yellowish green and nearly glabrous; leaflets 15 to 21, 3 to 7 lines long, narrowly oblong, broadest below the middle; peduncles very long, much exceeding

the leaves, bearing a loose spike-like raceme 4 to 6 in. long; corolla white; pod coriaceous, oblong, acute, finely nerved on the sides, $2\frac{1}{2}$ lines long, deflexed, 2-celled or nearly so.

Local in the hills between the Mayacamas Range and inner Coast Range: Indian Valley, Lake Co., *Cleveland*; Butt's Cañon, northern Napa Co., *Jepson*. June-July.

13. VICIA L. VETCH. TARE.

Annual or perennial herbs with weak angular stems, often slightly climbing. Leaves pinnate, with several to many leaflets and semi-sagittate stipules, the rachis ending in a simple or branched tendril. Peduncles axillary. Flowers solitary or racemose. Calyx 5-toothed, the 3 lower teeth often longer. Banner oblong, or appearing so by the turning back of the edges; wings united to the middle of the keel. Stamens more or less diadelphous. Style filiform with a tuft of hairs below the stigma all around or sometimes only on the back. Pod flat, 2 to several-seeded. Seeds globose, the funiculus expanded above to cover the hilum, thus arillate. Cotyledons remaining under ground in germination. (Classical Latin name.)

Annuals; flowers few, 1 or 2 in the axils.

- | | |
|--|--------------------------|
| Flowers subsessile..... | 1. <i>V. sativa</i> . |
| Flowers on elongated peduncles..... | 2. <i>V. exigua</i> . |
| Perennials; peduncles elongated, several-flowered..... | |
| Leaflets 8 to 12; peduncles 4 to 8-flowered..... | 3. <i>V. americana</i> . |
| Leaflets 20 to 30; peduncles 7 to 18-flowered..... | 4. <i>V. gigantea</i> . |

1. *V. sativa* L. COMMON VETCH. TARE. Stems slender, 2 ft. high; leaflets 6 to 12, glabrous, or the margins slightly ciliate, oblong or narrower, truncate or retuse, mucronate, $\frac{2}{3}$ to over 1 in. long; stipules small, toothed; flowers solitary or germinate, nearly sessile, the pedicels 1 line long at most; corolla 8 lines long, little longer than the calyx; banner purple, wings red; calyx-teeth subulate-setaceous, exceeding the tube.

Naturalized from the Old World: Santa Cruz; Berkeley; Napa Valley; Sonoma.

2. *V. exigua* Nutt. CALIFORNIA VETCH. Very slender, 1 to 2 ft. high; leaflets 4 to 12, oblong to narrowly linear, acute or obtusish; peduncles filiform, shorter than the leaves, $\frac{1}{2}$ to 2 in. long, 1 or 2-flowered; flowers 2 or 3 lines long, white or purplish; pod glabrous, 4 or 5-seeded.

Stony or sandy soil: Tracy; San Mateo Co.; more common in Southern California. Apr. Var. *HASSEI* Jepson. Stouter; leaflets of at least the lower leaves deeply notched at apex, the notch mucronate; pod 5 to 8 or sometimes only 3-seeded.—Benicia; Livermore; Southern California. Not common within our limits.

3. *V. americana* Muhl. Stems 2 to 3 ft. long, trailing or climbing by branched tendrils, sharply 4-sided or winged at the angles; herbage nearly glabrous; leaflets mostly broadly oblong, often widest above the middle, usually obtuse, mucronulate, less than 1 in. long; peduncles shorter than the leaves, 4 to 7 or 8-flowered; flowers at first purplish, changing to bluish, 9 lines long; calyx-tube 2 lines long, the lower teeth longer (1 line long), the upper approximate, incurved.

Common in the hill country. Feb.-May. Very variable in foliage. The following leaf varieties may be distinguished: Var. *LINEARIS* Wats., leaflets 1 to $1\frac{1}{2}$ in. long, $1\frac{1}{2}$ lines wide or less. Var. *TRUNCATA* Brewer, leaflets truncate at apex and 3-denticulate.

4. *V. gigantea* Hook. GIANT VETCH. Stout, somewhat pubescent, climb-

ing several ft. high and often forming extensive tangles and draperies over shrubs; leaflets 20 to 30, narrowly oblong or tapering somewhat from the base to the obtuse mucronulate apex; peduncles 7 to 18-flowered; calyx short, lower teeth about equaling the tube; corolla 6 or 7 lines long, pale purple or pale saffron; pod oblong, $1\frac{1}{2}$ in. long, glabrous, 3 or 4-seeded.

Along streams: San Francisco and Oakland northward near the coast. Mar.-June. Herbage blackening in drying.

14. LATHYRUS L. PEA.

Herbs, ours perennial. In technical character and in habit very similar to Vicia. Banner roundish or very broad. Upper teeth of calyx commonly shorter than the lower. Leaflets usually larger, in ours 3 to 5 pairs, mostly mucronate; rachis in some species not prolonged into a tendril. Style flat-tish, hairy along the upper side only, *i. e.*, next the free stamen. Seeds as in the preceding. (Old Greek name of the Pea.)

Leaves without tendrils; pod shortly stipitate.

Peduncle short, 1 or 2-flowered; stipules small.....1. *L. torreyi*.

Peduncle longer than the leaves, 2 to 6-flowered; stipules larger than the leaflets.....2. *L. littoralis*.

Leaves tendril-bearing; racemes many-flowered; pod sessile.

Stems angled.

Herbage dark green, more or less pubescent; diffuse or climbing plants; leaflets 1 in. long; stipules narrowly semi-sagittate, the lobes mostly lanceolate and entire; corolla purplish or purplish-tinged.....3. *L. vestitus*.

Herbage light green, glabrous; leaflets mostly exceeding 1 in., obtuse at base and apex; stipules large, broadly semi-sagittate, ovate, acuminate, the basal lobe broad, rounded and toothed; corolla rose-purple.....4. *L. bolanderi*.

Stems winged, the wing commonly herbaceous; stipules small, commonly entire.

Herbage puberulent but seemingly glaucous; leaflets elliptic to narrowly-oblong, $1\frac{1}{2}$ to 2 in. long, acute at both ends, with long straight nerves from or near the base; corolla white or yellowish white, purple-veined.....5. *L. watsonii*.

Herbage glabrous or nearly so; leaflets linear-lanceolate, about $1\frac{1}{2}$ in. long; corolla rose-purple.....6. *L. jepsonii*.

1. *L. torreyi* Gray. Erect, very slender, 4 to 9 in. high; herbage light green, sparingly villous; leaflets thin, elliptic to ovate or oblong, 5 to 7 lines long; leaves with a terminal leaflet or the rachis merely ending in a point; stipules small, semi-sagittate, lanceolate, the lower lobe very short; flowers 6 lines long; calyx-teeth subulate, exceeding the tube, or the upper shorter and broader; banner pale lilac, keel and wings white; pod linear-oblong, pubescent, 1 in. long, 3 to 5-seeded.

Shady woods: Santa Clara Co. and Napa Valley, Cahto and northward to Humboldt Co.

2. *L. littoralis* (Nutt.) Endl. BEACH PEA. Stems many from creeping rootstocks, stout, decumbent; herbage densely silky-villous, suggestive of a hairy Lupine; leaflets 1 to 3 pairs with a usually smaller or imperfect terminal one, cuneate-oblong, 4 to 6 lines long; stipules ovate or somewhat hastate, 2 or 3 times as large as the leaflets; peduncles exceeding the leaves; flowers 6 to 8 lines long; calyx-teeth nearly equal, as long as the tube; banner purple, the keel and wings white or nearly so; pod oblong, 1 in. long, villous, 3 to 5-seeded.

Maritime: seashore of San Francisco and Marin cos. and northward.

3. *L. vestitus* Nutt. var. *puberulus* Jepson. Low and herbaceous, or climbing several feet high on shrubs and woody below; stems angled; leaflets puberulent under a lens, dark green, lighter on the under surface, 1 in. long, 2 to 4 lines wide, tapering to both ends from the middle, usually more acute at apex than at base, mucronulate; raceme many-flowered on a rather

short peduncle; flowers 8 or 9 lines long, purplish or purplish-tinged; lowest calyx-teeth lanceolate, nearly equaling or exceeding tube; seed with a small aril.

The most common species: Napa Valley; Oakland Hills, etc. Mar.-Apr., but often flowering at all seasons.

4. *L. bolanderi* Wats. Stem angled; herbage rather light-colored, perfectly glabrous; leaflets mostly exceeding 1 in., elliptic-ovate, obtuse at base and apex, mucronulate; stipules large, ovate, acuminate or ovate-lanceolate, dilated below into a rounded toothed lobe, often 5 lines broad; lower calyx-teeth distinctly longer than tube; corolla rose-purple, fading yellowish.

Vicinity of the ocean: Oakland Hills; Berkeley; San Mateo Co.; Angel Island. Apr.

5. *L. watsonii* White. Stems stoutish, erect, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, with zigzag branches; herbage light green, commonly glaucous, finely pubescent; leaves $1\frac{1}{2}$ to 2 in. long, 6 to 8 lines wide, tapering from the middle to each end, acute, mucronate, strongly several-nerved from the base, the nerves branching little and almost parallel; stipules semi-sagittate, narrow, the upper lobe lanceolate, the lower lobe little dilated, commonly entire; raceme few (5 to 11) flowered, on a peduncle 3 to 7 in. long; flowers 10 lines long, white, veined with purple; lower calyx-teeth lanceolate, subequal, longer than tube; pod 2 in. long, 4 lines broad; seed with a small aril.

Foothills of the inner Coast Ranges and sandy ridges of the Sacramento Valley bordering them; Sierra Nevada foothills; also Mendocino Co., Sonoma, and Carmel Mission, acc. to Watson. Mar. Distinguished from *L. bolanderi* by its much smaller and narrower stipules, by its leaflets which are acute at both apex and base, and by the strong straight nerves from or near the base, which proceed much above the middle of the leaflet.

6. *L. jepsonii* Greene. Stems 4 to 6 ft. high, strongly winged along the angles, the wings herbaceous but often callous-margined; herbage glabrous; leaflets 8 to 12, linear-lanceolate, mostly $1\frac{1}{2}$ in. long, markedly venulose; stipules semi-sagittate, both the apical and basal lobes lanceolate; peduncles mostly shorter than the leaves; corolla rose-purple, 9 lines long; lower calyx-teeth unequal, the middle one equaling the tube.

Suisun Marshes. Aug.-Sept.

LINACEAE. FLAX FAMILY.

Annual or perennial herbs. Leaves alternate, or sometimes opposite, small, entire, without stipules or these sometimes replaced by a gland. Flowers mostly in cymose panicles, perfect, regular, in ours 5-merous. Petals distinct, very quickly falling. Stamens ~~5~~, slightly united at base. Styles 2 to 5, distinct. Cells of the superior ovary as many as the styles, or twice as many by the formation of a false division wall from the back of each cell. False partitions frequently not complete. Fruit a capsule, splitting through the false partitions and frequently also septicial.

1. LINUM L. FLAX.

Our only genus. (Ancient Latin name of these plants.)

Perennial; styles 5; flowers blue; petals without ventral appendages.....1. *L. lewisii*.
Annual; styles 3; petals commonly with appendages.

Leaves closely margined with stipitate glands; pedicels long, solitary.....
2. *L. adenophyllum*.

Leaves entire.

Pedicels elongated and flowers mostly solitary; stem diffusely paniculate above; flowers pinkish or white.

- Flowers about 3 lines long, on straight pedicels.....3. *L. spergulinum*.
 Flowers about 2 lines long, on nodding pedicels.....4. *L. micranthum*.
 Pedicels short and flowers in rather close clusters.
 Flowers white, pink or rose-purple.
 Stem paniculately branched; sepals glabrous.....5. *L. californicum*.
 Stem shortly branched at top; sepals pubescent.....6. *L. congestum*.
 Flowers yellow.....7. *L. breweri*.

1. *L. lewisii* Pursh. BLUE FLAX. Stems several from a woody crown, erect, thickly clothed with leaves, simple below the corymbosely branched summit; herbage glabrous; leaves linear-lanceolate or linear, acute, 5 to 9 lines long; flowers in terminal loose and somewhat corymbose clusters, or racemose on the branches; corolla blue, 6 to 9 lines in diameter; pedicels $\frac{1}{2}$ in. long or more; sepals ovate, 3 to 5-nerved; capsule globose, acute, 4 or 5 lines long, eventually dehiscent by 10 valves, the valves often with a brown midnerve.

Coast Ranges, rare; Sierra Nevada and far northward.

L. DIGYNUM Gray. Stem slender, simple below, corymbosely forked above, 5 to 8 in. high; flowers short-pedicelled; petals yellow, not appendaged; carpels 2, the false septa complete.—Northern California and northward.

2. *L. adenophyllum* Gray. Stem 11 to 14 in. high, unbranched below, repeatedly forked above and forming a widely branched panicle; leaves alternate or the lowest opposite, lanceolate, $\frac{1}{2}$ in. long or less, the margin conspicuously glandular-ciliate; flowers yellow or yellowish white, about 2 lines long, on very slender pedicels 1 to 5 lines long; appendages of the petals broad and confluent, somewhat pubescent; filaments abruptly dilated and 2-toothed at base; capsule as long as the lanceolate sepals.

Open hills: Lake and Mendocino cos.

L. CLEVELANDII Greene. Repeatedly dichotomous, 8 to 12 in. high, glabrate; leaves oblong, 5 lines long, without stipular glands; flowers minute, on filiform pedicels sometimes an inch long; petals yellow, 1 line long or less, 2-toothed, 3-appendaged; capsule somewhat longer than the sepals.—Lake and Mendocino cos., in the geographical gap of *L. micranthum*, between Mt. Tamalpais and Mt. Diablo on the south, and Hy-am-pum on the north.

3. *L. spergulinum* Gray. Stems more or less dichotomously paniculate, 11 to 18 in. high; leaves linear; pedicels filiform, rigid, straight, 3 to 10 lines long; flowers pinkish white, 3 to $3\frac{1}{2}$ lines long; sepals ovate, nearly 1 line long; petals 2-toothed, with 3 appendages, the middle one ligulate and the lateral often reduced; capsule ovoid, acute, nearly twice as long as the sepals.

North Coast Ranges: Lake and Mendocino cos.

4. *L. micranthum* Gray. Freely branched above the base but the branches commonly rather closely ascending, 5 to 10 in. high, somewhat soft pubescent toward the base; leaves linear-oblong, obtuse, 3 to 6 lines long; flowers white or pinkish, commonly 2 lines long, somewhat nodding on filiform pedicels; fruiting pedicels 2 to 4 lines long; sepals oblong-lanceolate, the inner sparingly glandular-ciliate; petals commonly 1 to rarely $2\frac{1}{2}$ lines long, 2-toothed, mostly without appendages; capsule ovoid, equal to the sepals.

Mt. Diablo; Mt. Tamalpais; Hy-am-pum; Sierra Nevada.

5. *L. californicum* Benth. Glabrous and glaucous plants 10 in. to 2 ft. high, paniculately branched, with angled or striate branches; leaves linear, 5 to 12 lines long, with prominent stipular glands; flowers white or pinkish; sepals lanceolate, with sparingly glandular-ciliate inner margins; petals 2 to 3 lines long, 3-appendaged, the median appendage rounded and hairy; capsule ovoid, acute, a little shorter than the sepals.

Napa Co. southward through the Mt. Diablo Range to the San Carlos Range.

6. **L. congestum** Gray. Corymbosely branched at top, 8 to 18 in. high; leaves somewhat pubescent, 4 to 13 lines long, with stipular glands; flowers rose-purple, 3 to 4 lines long, terminating the branches in clusters; sepals pubescent; petals with 3 appendages, the middle one elongated and hairy; capsule short-ovoid, nearly as long as the calyx.

Marin Co.; San Francisco. Hardly more than a form of *L. californicum*.

7. **L. breweri** Gray. Stems 9 to 14 in. high, with a few short branches at the top; glabrous and glaucous; leaves narrowly linear, 5 to 8 lines long; flowers yellow, 3 lines long; sepals ovate, some slightly glandular on the margin; petals obovate, not emarginate, more than 2 times as long, 3 appendaged at base.

Dry hill or cañon sides: Mt. Diablo; Vaca Mts. June.

OXALIDACEAE. OXALIS FAMILY.

Ours low herbs with sour juice and palmately 3-foliolate leaves. Flowers complete, regular, symmetrical, 5-merous. Ovary superior, 5-celled; styles 5, distinct. Fruit a loculicidal capsule.

1. OXALIS L. WOOD SORREL.

Leaflets obovate, closing and drooping at night. Peduncles axillary, 1 to several-flowered. Sepals imbricated. Stamens 10, the filaments somewhat dilated and united at base. Glands none. Capsule membranous, 5-celled, more or less 5-lobed, the cells opening on the dorsal sutures through which the seeds are ejected, the valves remaining attached to the axis by the partitions. Seeds 2 to several in each cell. (Greek oxus, sour, the juice containing oxalic acid.)

Leaves alternate on the stem; flowers yellow.....1. *O. corniculata*.
Leaves all radical; flowers pink, white or rose-color.....2. *O. oregana*.

1. **O. corniculata** L. YELLOW SORREL. Perennial by running rootstocks, villous-pubescent; stems herbaceous, slender, decumbent or ascending, 3 to 6 in. long; leaflets mostly obovate, $1\frac{1}{4}$ in. long, on slender petioles with small villous stipules; peduncles axillary, elongated, bearing two or more flowers; petals yellow; capsule erect in fruit, linear, $\frac{1}{2}$ in. long, many-seeded.

Behaving in the Bay region after the manner of an introduced plant; flowering through the spring, summer and autumn.

2. **O. oregana** Nutt. REDWOOD SORREL. Acaulescent perennial, more or less rusty-villous; leaflets broadly obovate, broader than long, 1 to $1\frac{1}{2}$ in. long; scapes from creeping rootstocks equaling or exceeding the leaves, 2-bracted near the top, commonly 1-flowered; petals oblong-obovate, 9 to 12 lines long, pink, white, or rose-color, often veined with purple; capsule linear, 9 lines long; cells about 6-seeded.

Shady woods in the Redwood belt from the Santa Lucia Mts. and Santa Cruz Mts. to Marin and Sonoma cos. northward. Mar-Apr.

GERANIACEAE. GERANIUM FAMILY.

Ours herbs with lobed and divided leaves and scarious stipules. Flowers complete, regular, symmetrical, 5-merous. Sepals persistent. Petals deciduous. Stamens as many or twice as many as the petals. Ovary superior, 5-celled, deeply lobed, the 5 styles united around the elongated axis (prolongation of the receptacle) and free only at tip. Fruit of 5 one-seeded carpels separating elastically when ripe from the central persistent axis and bearing the twisted or spirally coiled styles as tails.

Stamens with anthers 10; leaves palmately parted.....1. GERANIUM.
 Stamens with anthers 5; leaves pinnatifid or pinnate, or roundish-cordate.....2. ERODIUM.

1. GERANIUM L. CRANESBILL.

Herbs (ours annual) with forking stems, swollen nodes and stipulate palmately parted leaves. Peduncles axillary, umbellately 2 to 3-flowered, or 1-flowered. Flowers regular, 5-merous, the sepals imbricate in the bud. Stamens 10, sometimes slightly connate at base, all with perfect anthers, the 5 longer alternate with the petals and with glands at their base. Styles in fruit nearly glabrous inside. Cotyledons plicate, incumbent on the caulicle. (Greek geranos, a crane, from the elongated fruit-bearing beak.)

Flowers light pink.....1. *G. carolinianum*.
 Flowers purple.....2. *G. dissectum*.

1. *G. carolinianum* L. CAROLINA GERANIUM. Hirsute-pubescent and often somewhat glandular; smaller plants erect, the larger ascending or decumbent, 7 to 14 in. high; leaves palmately 5 to 7-parted, the cuneate segments more or less incisely dissected or toothed, the ultimate segments rather broad; peduncles commonly shorter than the petioles; flowers about 3 lines long; petals light pink; beak of fruit loosely villous or glandular; carpels hairy, usually black; seed reticulately ridged or pitted.

Naturalized plant from the Eastern United States, at one time rather common in the Bay region, now rarely seen. Mar.-Apr.

2. *G. dissectum* L. COMMON GERANIUM. Differing little from the last, but the primary lobes of the leaves very narrow, with the ultimate divisions mostly slender, somewhat falcate, and acute; petals rose-purple.

Naturalized from Europe and becoming very common in the Bay region. *G. PILOSUM* Forst. of Australia and New Zealand, adventive at Alameda and San Francisco, is a similar species but is perennial by a thick rootstock and retrorsely canescent-pubescent but not glandular. *G. MOLLE* L. has glabrous carpels, conspicuously wrinkled transversely, and unpitted seeds; reported as occurring at San Francisco and at Olema.

2. ERODIUM L'Her. STORKSBILL.

Annual herbs. Leaves opposite, often unequal, either simple or pinnate, with one interpetiolar stipule on one side and two on the other. In vegetative characters very similar to Geranium; the flower and fruit nearly the same, but the stamens with anthers 5 only, the alternate filaments sterile and scale-like. Styles bearded inside. Pedicels after anthesis commonly retrocurved. (Greek erodios, a heron.)

Leaves reniform-cordate, lobes (if any) shallow.....1. *E. macrophyllum*.
 Leaves oblong to oblong-ovate, pinnatifid or pinnate.....2. *E. botrys*.

Leaves pinnatifid; sepals bristle-tipped.....3. *E. moschatum*.
 Leaves pinnate with serrate or merely incised leaflets; petals with naked claw; sepals not terminated by bristles.....4. *E. cicutarium*.

1. *E. macrophyllum* H. & A. Acaulescent or subacaulescent, tomentose, with interspersed spreading glandular hairs; leaves reniform-cordate, crenate and often with shallow crenate lobes, 1 to 1½ in. broad; umbels mostly 2 to 3-flowered, on elongated (4 to 9 in.) peduncles; petals white, 5 to 8 lines long, little exceeding the broad sepals; filaments conspicuously orbicular-dilated at base; beak of fruit stout; mature carpels densely silky-hairy, truncate at top, 4 lines long.

Coast Ranges; Sacramento and San Joaquin valleys. (Has neither the

habit nor the distribution of a native.—Zoe, iv, 86.) Var. *CALIFORNICUM* Jepson. Tall and branching, puberulent and beset with purple-tipped glandular hairs; leaves larger, 2 in. broad; flowers frequently about 5 or 6 in a cluster; petals deep rose-red or purple.—Oakland Hills.

2. *E. botrys* Bertol. Caulescent, branching from the base and commonly prostrate; herbage coarsely white-pubescent; leaves 1 to 2 in. long on petioles as long or twice as long, oblong-ovate, pinnatifid, the lobes serrate, acute; sepals short-pointed and tipped with 1 or 2 short bristles; petals deep violet; glands greenish; filaments dilated nearly to apex and toothed.

Mediterranean plant widely naturalized in the North Coast Ranges, Great Valley, and Sierra Nevada foothills. On low pastured hills and rolling gravelly plains its rosettes of leaves are formed in winter or early spring, lie flat on the ground, kill out other seedlings and effectively protect the plant from close competition.

3. *E. moschatum* L'Her. WHITE-STEM FILAREE. MUSK CLOVER. Hirsute with scattered spreading hairs, at first acaulescent, the radical leaves often forming a close rosette upon the ground; later with stout fleshy ascending stems $\frac{1}{2}$ to 1 ft. high; leaves 2 or 3 in. to $1\frac{1}{2}$ ft. long; leaflets ovate to elliptical, serrate and sparsely incised, short-petiololate, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, the terminal cuneately 3 to 5-parted; stipules large, membranous; peduncles in the axil of the smaller of the unequal opposite leaves, much elongated in fruit, 4 to 11 in. long; sepals not bristle-bearing at tip; petals rose-purple, 3 lines long, with short claws; filaments membranously winged at base, with upwardly pointing teeth; beak of the fruit $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long.

Abundant in rich lands of valley orchards and vineyards, often in the North Coast Ranges forming extensive pure growths and far more common than the next. Mar.-Apr. Glands of the flowers reddish or brownish as in the next. The term Filaree, a contraction of the Spanish Alfilerilla, is, like the names Pin Clover or Pin Grass, indifferently applied to either this species or the next.

4. *E. cicutarium* (L.) L'Her. RED-STEM FILAREE. Habit of the preceding; leaflets sessile, nearly oblong, incisedly pinnatifid with acute, often toothed lobes; stipules small, acute; flowers and fruit as in the last, but the sepals terminated by 1 or 2 bristle-like hairs and the filaments little dilated at base, not toothed.

Barren hillsides or dry plains everywhere; far more common than no. 3 in all interior or semi-arid regions. Beginning to flower in Feb. or Mar. and in many places continuing through the summer. It is an esteemed forage plant. Stems commonly reddish, in no. 3 commonly with white stems.

LIMNANTHACEAE. MEADOW FOAM FAMILY.

Annual herbs with dissected alternate leaves without stipules. Flowers complete, regular, symmetrical, 3 to 6-merous. Calyx of distinct sepals, persistent, free from the ovary. Petals withering-persistent. Stamens twice as many as the petals. Carpels 5, nearly distinct but with a common style arising from among them near the base, at length separating from a very short axis as 1-seeded nutlets.

1. FLOERKEA Willd.

Flowers solitary on axillary peduncles, ours 5-merous (exceptionally 4 or 6-merous). Sepals valvate in the bud, as many hypogynous glands alternating with them. Stamens distinct. Style 5-cleft at apex. (H. G. Floerke, a German botanist.)

1. *F. douglasii* Baill. MEADOW FOAM. Branching from the base and spreading, the branches 6 to 14 in. long; herbage yellowish green, succulent, glabrous; leaves pinnately divided, the divisions 3 to mostly 9 and incisely lobed or parted, the lobes linear, acute; peduncles at length 2 to 4 in. long; sepals lanceolate, 3 to 4 lines long, $\frac{1}{2}$ the length of the petals; petals white (or occasionally roseate), yellowish at base, obovate-cuneate, a U-shaped band of hairs on the claw; nutlets smooth to strongly tuberculate, about 2 lines in diameter.—(*Limnanthes douglasii* R. Br.)

Low ground in or near shallow water, forming large patches which color in Apr. the valley levels in the Coast Ranges. Its beauty in white and yellow nearly as pleasing as that of blue in *Nemophila menziesii*. Cultivated in England as a honey-bee plant.

F. ROSEA Greene. Petals whitish with longitudinal rose-colored lines.—Sacramento Valley: Willows, *W. L. J.*, 1899. F. ALBA Greene. Nutlets prominently rugose tuberculate.—Sierra Nevada.

POLYGALACEAE. POLYGALA FAMILY.

Ours perennial herbs or somewhat suffrutescent plants with alternate simple leaves and no stipules. Flowers in terminal racemes, irregular and resembling the papilionaceous flowers of Leguminosae, but not like them in structure. Stamens (in ours) monadelphous. Ovary simple, superior.

1. POLYGALA L. MILKWORT.

Stems often with milky juice. Sepals 5, thin, the two lower and the upper keeled one of about the same size, the two lateral much larger, colored, and projecting like the wings of a pea-flower. Petals 3, united at base; middle petal hooded above and often beaked or crested, enclosing the stamens and style. Stamens 8, monadelphous, the tube open on one side and adnate to the base of the petals. Ovary 2-celled with one ovule in each cell; style long, curved. Capsule with thin walls, flattened contrary to the partition, rounded and often notched above, dehiscing loculicidally at the margin. Seeds with a conspicuous caruncle. (Polus, much, and gala, milk, an ancient Greek name for some shrub used as a stimulant.)

1. *P. californica* Nutt. Stems many from the branching crown of a cord-like deeply descending perennial root, mostly simple, 3 to 8 in. high; leaves oblong- or elliptic-ovate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, distinctly petioled; flowers of two sorts:—those near the root apetalous and developing most of the fruit; those of the terminal racemes with rose-purple corolla 5 or 6 lines long, the petals more or less pubescent, at least inside or on the margin, the sepals glabrous, with the shorter ones 2 to 3 lines long; capsule broadly elliptical, glabrous, 3 lines long; caruncle of the seed wrinkled and bladdery.

Wooded or brush-covered slopes in the Coast Ranges from Santa Barbara to Marin Co. and the Napa Range and northward to Oregon. Not reported from the inner Coast Range. May.

P. CORNUTA Kell. of the Sierra Nevada, may be distinguished by its greenish white flowers and densely tomentose sepals.

EUPHORBIACEAE. SPURGE FAMILY.

Our herbs, or one species somewhat suffrutescent. Leaves simple, stipulate or exstipulate. Flowers (in ours) monoecious, always apetalous, often naked, *i. e.*, destitute of calyx as well, sometimes exceedingly reduced and enclosed in a calyx-like involucre. Stamens 1 to many. Ovary superior, 3 or 1-celled,

with one or two pendulous ovules in each cell. Styles or stigmas as many or twice as many as the cells of the ovary. Capsule commonly 3-lobed, 3 or 2-valved. Embryo straight, the flat cotyledons almost as wide as the fleshy or oily endosperm.

Flowers with a true calyx, not borne in an involucre; herbage densely stellate-pubescent. Upper leaves opposite; staminate flowers in corymbs; capsule 1-celled.....

Leaves all alternate; staminate flowers in racemes; capsule 3-celled.....1. EREMOCARPUS.
Flowers borne in a calyx-like involucre, which has 4 or 5 teeth and bears more or less petal-like glands; true calyx none; capsule 3-celled.....2. CROTON.
.....3. EUPHORBIA.

1. EREMOCARPUS Benth.

A low annual with entire 3-nerved leaves without stipules. Staminate flowers in terminal corymbs; calyx 5 to 6-parted; stamens 6 or 7 on a hairy receptacle; filaments exerted. Pistillate flowers 1 or few in the lower axils, without calyx; ovary 1-celled, with 4 or 5 small glands at the base; style undivided, stigmatic at apex; capsule 2-valved, 1-seeded. (Greek eremos, solitary, and karpus, fruit.)

1. *E. setigerus* Benth. TURKEY MULLEIN. Stems dichotomously branched, prostrate and forming close mats 1 to 2 ft. wide or more, sometimes ascending and forming a very broad low plant; herbage gray with an appressed stellate pubescence and rough with spreading hispid hairs; leaves alternate or the upper opposite, thick, ovate, the smaller varying to almost round, $\frac{1}{4}$ to $1\frac{1}{2}$ in. long, the petioles nearly as long or longer; staminate flowers pediceled, the oblong segments of the calyx 1 line long; pistillate flowers in clusters of 1 to 3, the ovary and style densely pubescent; capsule 2 lines long; seeds smooth and shining, $1\frac{1}{2}$ lines long.

Dry open areas, very abundant towards the interior: plains of the Sacramento and San Joaquin; Sierra Nevada foothills; low hills and valley fields of the Coast Ranges. The California Indians used the heavy-scented herbage of this plant to stupefy fish in small streams in order that they might be caught by hand, whence the Spanish-Californian name, Yerba del Pescado. The seeds are sought by turkeys and by turtle-doves. Called "Woolly White Drouth Weed" in Orange Co.

2. CROTON L.

Ours perennial herbs, suffrutescent at base, with alternate entire leaves. Staminate flowers in racemes; calyx 5-parted; glands of the disk as many as and opposite the sepals; stamens 5 to many. Pistillate flowers mostly solitary; calyx 5-parted; ovary 3-celled, the cells 1-ovuled; styles twice forked. Capsule 3-lobed, globose in outline. Seeds smooth and shining, with a caruncle. (Kroton, a tick, the Greek name of the Castor Plant, its seeds resembling that insect.)

1. *C. californicus* Müll. Arg. Stems branching, erect or diffuse, from a woody base; herbage hoary, except the upper side of the leaves which is green and finely stellate-pubescent; leaves oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, on petioles 4 lines to over 1 in. long; staminate racemes at length $\frac{1}{2}$ in. long, developing gradually, the flowers soon deciduous after anthesis and leaving an elongated naked rachis; staminate calyx about 1 line long; disk obscurely 5-lobed; stamens 9 to 11, with hairy filaments; pistillate flowers on short pedicels; styles twice forked; capsule scurfy, 2 lines in diameter.

Sandy hills near the ocean from the San Francisco peninsula southward to Southern California; also near Antioch.

3. EUPHORBIA L. SPURGE.

Ours herbs. Involucres solitary in the forks or in terminal umbels, with 4 or 5 teeth alternating with as many glands; glands either naked or appendaged (*i. e.*, with a colored margin). Flowers monoecious, both pistillate and staminate naked and included in an involucre which itself resembles a flower but really encloses a cluster of flowers consisting of several staminate and 1 pistillate flower. Staminate flower very much reduced, consisting of a single stamen; filament jointed on a short pedicel like it, the pedicel often with a minute seale or bract at base, showing that the stamen is a distinct flower. Pistillate flower supported on a pedicel in the center of the involucre and soon protruded from it, consisting of a 3-celled ovary and 3 bifid styles. Capsule with 3 cells, each 1-seeded. (Euphorbus, King Juba's physician.)

Stems prostrate; leaves small, all opposite and more or less unequal at base, stipulate; glands of the involucre with a petal-like white or reddish appendage.

Herbage glabrous; stems and leaves infrequently reddish.

Leaves obovate or oblong, minutely serrulate at apex.....1. *E. serpyllifolia*.

Leaves deltoid to ovate-oblong, entire.....4. *E. ocellata*.

Herbage often hairy or puberulent; leaves commonly margined with a red or with a central red spot.

Stipules lanceolate, fimbriate2. *E. maculata*.

Stipules triangular, slightly lacerate.....3. *E. hypericifolia*.

Stems erect; leaves larger, stipules none; no colored margins to the glands.

Stem-leaves alternate.

Glands disk-like, entire; capsule with warty lobes.....5. *E. dictyosperma*.

Glands crescent-shaped, 2-horned; capsule smooth.....6. *E. leptocera*.

Stem-leaves in 4 ranks; glands crescent-shaped.....7. *E. lathyris*.

1. *E. serpyllifolia* Pers. THYME-LEAVED SPURGE. Stems terete, or more or less angled, repeatedly branched, forming prostrate mats 1 to 3 ft. across; herbage glabrous and green; leaves oblong or obovate-spatulate, unequal at base, more or less minutely serrate toward the apex; stipules setaceous or lacerate; involucre $\frac{1}{2}$ line long or less; glands transversely oblong and more or less cupped in the center; appendages narrow, crenately serrate or nearly entire; seeds sharply quadrangular, slightly rugose or more manifestly so and thus appearing shallow-pitted.

Stream beds and low grounds: Coast Ranges, Sacramento Valley and southward. Aug.-Oct. Var. *CONSANGUINEA* Boiss. Herbage with more or less red coloration; stems more erect; apex of leaves sharply serrate; lobes of the involucre lacerate; seeds less sharply angled.—Upper Sacramento Valley; Napa Valley. Var. *RUGULOSA* Engelm. Plants more thickly matted; leaves more serrate on the larger side of the unequal leaf; seeds finely rugulose.—Suisun; Berkeley. Var. *OCCIDENTALIS* Jepson. Herbage dull yellowish green; appendages of the involucre crenately lobed; seeds sinuate-rugose.—Humboldt Co. and Mt. St. Helena.

2. *E. maculata* L. SPOTTED SPURGE. Stems radiately branching, prostrate; herbage hairy or puberulent; leaves oblong-linear, usually with a red blotch in center, serrulate, subcordate at base; stipules fimbriate; involucre with 4 cup-shaped glands; capsule acutely angled; seeds transversely wrinkled and minutely pitted.

Occurring as an immigrant from the eastern United States acc. to Greene.

3. *E. hypericifolia* L. LARGE SPURGE. Glabrous or sparingly hairy, ascending or sometimes prostrate, the branches $\frac{3}{4}$ to $1\frac{1}{2}$ ft. long; leaves ovate-oblong to oblong-linear, 3-nerved, unequally serrate, commonly with a red spot or red margins; stipules triangular, slightly lacerate; peduncles longer than the petioles; appendages of the involucre white or red, entire; capsule glabrous, obtusely angled; seeds with broken transverse ridges.

Introduced in Napa Valley along the railroad.

4. *E. ocellata* Dur. & Hilg. Annual, prostrate, the branches 5 to 9 in. long; leaves thickish, deltoid to ovate-oblong, often cordate at base, entire, 2 to 4 lines long; involucre campanulate, nearly 1 line long, its lobes fringed; glands 2 to 4, yellowish or purplish, short-stipitate, circular and discoid, with or without a narrow margin; capsule 1 line long; seeds round-ovate, smooth or obscurely rugose.

Stockton, *Sanford*, and southward through the San Joaquin Valley to Southern California.

5. *E. dictyosperma* F. & M. Annual, glabrous; stems erect, 5 to 15 in. high, simple or branching from the base, dichotomously branched above; lower leaves alternate, oblong- or obovate-spatulate, serrulate, often retuse, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; upper and floral leaves opposite, round-ovate to oblong, 3 to 6 lines long; inflorescence umbelliform, the rays 2 or 3 times forked; involucre and glands small; capsule with warty lobes, 1 to $1\frac{1}{4}$ lines long.

Throughout California but much less common than no. 6. Sacramento Valley.

E. PEPLUS L., Petty Spurge, spontaneous within inclosures at Berkeley; the involucre bears 4 crescent-shaped glands with long slender horns, and a pair of wing-like crests on each lobe.

6. *E. leptocera* Engelm. Annual or biennial, glabrous, branching at base, 10 to 16 in. high; branches decumbent at base or commonly erect, 2 or 3 times dichotomous above; leaves alternate, obovate to spatulate, obtuse, sometimes mucronate, entire, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, the floral opposite or ternate, deltoid or broadly rhombic-ovate, sometimes cordate at base or connate, acute, 3 to 5 lines long; involucre turbinate, its transversely oblong lobes denticulate; glands large, crescent-shaped, the slender horns entire or cleft; capsule smooth, $1\frac{1}{2}$ lines broad; seeds ash-colored, dark-pitted, $1\frac{1}{2}$ lines long, with a prominent caruncle.

Common in both the Coast Ranges and Sierra Nevada.

7. *E. lathyris* L. CAPER SPURGE. Tall stout annual or biennial, 1 to 3 ft. high, very smooth and glaucous; stem-leaves linear or narrowly oblong, thick, in 4 vertical ranks, the floral oblong-ovate and cordate; umbels of 3 or 4 rays, once or twice forked; glands of the involucre crescent-shaped, the horns short and blunt; capsule large and smooth; seeds wrinkled.

Mediterranean species spontaneous about some early settlements of Alta California: San Francisco; Berkeley. Also called "Gopher Plant."

CALLITRICHACEAE. WATER STARWORT FAMILY.

Herbs growing in shallow water or in the mud of drying vernal pools. Leaves opposite, entire, exstipulate, often crowded and forming a rosette at the ends of the branches. Flowers monoecious, axillary and solitary, or 2 or 3 together in one axil, without calyx or corolla but often with two membranous bracts. Staminate flower consisting of 1 terminal stamen. Pistillate flower consisting of a 4-celled ovary with 2 filiform stigmas. Fruit 4-lobed, splitting at maturity into as many nutlets.

1. CALLITRICHE. L.

The only genus. (Greek kallos, beautiful, and trichos, a hair, on account of the slender stems.)

Fruit sessile; flowers 2-bracted; submerged leaves notched at apex..... 1. *C. palustris*.
Fruit on a pedicel 2 to 5 lines long; flowers bractless; leaves not notched at apex.....

2. *C. marginata*.

1. **C. palustris** L. WATER FENNEL. Aquatic; stems 5 to 10 in. long; submerged leaves narrowly linear, 1-nerved, notched at the apex, 7 to 10 lines long; emerged or floating leaves obovate, narrowed at base into a slender petiole, 2 to 6 lines long; fruit obovate, flattened, notched at apex, $\frac{1}{2}$ to 1 line long; each lobe sharply winged on the back for its whole length, the proximate lobes with a groove between them.—(*C. verna* L. in part.)

Cold pools or slow streamlets: Napa Valley; Marin Co.; Gilroy. Mar.-May.

2. **C. marginata** Torr. Stems 2 to 4 in. long, forming dense mats in the moist beds of vernal pools from which the water has disappeared; leaves oblanceolate, 2 or 3 lines long; plants sometimes submersed and the leaves linear; bracts none; styles long, reflexed, soon deciduous; fruit rather less than $\frac{1}{2}$ line long, broader than long, notched both at apex and base, the lobes sharply winged; fruiting pedicels 2 to 5 lines long.

Napa Valley southward to the San Joaquin Valley and Southern California.

RUTACEAE. RUE FAMILY.

Herbaceous or arboreous plants, ours shrubs or small trees, with glandular-dotted or aromatic leaves and no stipules. Flowers regular and symmetrical, or nearly symmetrical. Sepals and petals 4 or 5. Stamens as many or twice as many, inserted outside of a hypogynous disk encircling the base of the ovary.

1. PTELEA L.

Leaves pinnately trifoliolate with sessile leaflets. Flowers small, greenish white, in axillary paniculate cymes. Flowers polygamous. Sepals, petals and stamens 4 or 5. Ovary with a short thick stipe, 2-celled; cells 2-ovuled, the lower ovule abortive; style short; stigmas 2. Fruit a 2-celled 2-seeded samara, winged all around, broadly orbicular. (Greek name of the Elm, the fruit of which is very similar.)

1. **P. baldwinii** T. & G. var. **crenulata** Jepson. HOP TREE. Small tree 8 to 15 ft. high; glabrous or with a slight pubescence on the inflorescence and under surface of the leaves; leaves elliptic, obovate or elongated-rhomboidal, rounded or acute at apex, often with abruptly cuneate base, crenulate or almost entire, 1 to $2\frac{3}{4}$ in. long; buds downy; sepals very small; petals $2\frac{1}{2}$ lines long; stamens hairy towards the base; fruit straw-yellow, 5 to 6 lines long, a trifle broader, tipped by the persistent style.—(*P. angustifolia* of Bot. Cal.)

Coast Ranges: Lake Co.; Mt. Diablo. Sierra Nevada foothills. Apr.-May.

ANACARDIACEAE. SUMACH FAMILY.

Trees or shrubs with resinous or milky acrid juice and alternate leaves. Flowers very small, regular, either perfect or polygamous. Calyx commonly 5-parted, a glandular ring or cup-like disk lining its base. Petals commonly 5, the stamens as many or twice as many. Ovary free from the calyx and from the disk, 1-celled, 1-ovuled; styles 3. Fruit a dry berry-like drupe; seed without endosperm.

1. RHUS L. SUMACH.

Leaves simple or (in ours) 3-foliolate and deciduous. Stamens 5, inserted under the edge of the disk. Drupe small, compressed, with thin flesh and bony stone. (Ancient name.)

Southern California has three evergreen species with simple leathery leaves and flowers in panicles.—1. *R. LAURINA* Nutt. Laurel-Sumac. Panicle much branched with slender divisions, glabrous or nearly so; leaves mostly ovate or lanceolate; drupe 1 line long. 2. *R. INTEGRIFOLIA* B. & H. Sour Berry. Panicle composed of stout spikes, finely pubescent; leaves elliptic, rounded at apex; drupes 2 to 5 lines long. 3. *R. OVATA* Wats. Sugar Bush. Like no. 2 but with ovate leaves acute or acuminate.

Flowers greenish, in panicles; drupe whitish, the stone rough.....1. *R. diversiloba*.
Flowers yellowish, in spikes; drupe red, the stone smooth.....2. *R. trilobata*.

1. ***R. diversiloba*** T. & G. POISON OAK. Erect shrub 4 to 8 ft. high, or behaving as a vine and ascending the trunks of trees up to 15 ft. or more by means of adventitious rootlets; leaflets orbicular to ovate or oblong-ovate, undulate or plane, entire or variously lobed, segmented or toothed, 1 to 4 in. long; panicles axillary, appearing with the leaves, short-peduncled, more or less pendulous; flowers $1\frac{1}{2}$ lines long; sepals often unequal and sometimes 4; petals ovate, revolute so as to appear lanceolate, often slightly pencilled with a few black dots; anthers yellow; drupe whitish, 3 lines broad, the flesh marked with many longitudinal impressed black fibres, the stone rough or striate.

Coast Ranges and foothills of the Sierra Nevada, widely distributed and often abundant. Secreting a juice (non-volatile oil) which is highly poisonous, although some persons are not susceptible to its effects. Mules and horses browse on the foliage. In some districts bees make honey from the flowers; the honey is of good grade, sold on a commercial scale and carries no poison.

2. ***R. trilobata*** Nutt. SQUAW BUSH. Somewhat diffusely branching, 2 to 5 ft. high; leaflets broadly ovate or elliptic in outline, cuneate at base (especially the terminal one), crenate, or crenately lobed, cleft, or divided, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; spikes about $\frac{1}{2}$ in. long, often clustered; flowers pale yellow, appearing before the leaves, 1 line long; sepals scarious; petals elliptic; disk yellow, 5-lobed; drupe scarlet, viscidly pilose, the stone smooth.

Coast Ranges, Sierra Nevada and Southern California, favoring cañon bottoms or flats along streams in the mountains. Not poisonous. An important species to the Indians in their crafts, the split stems furnishing splints for basket-making which are light straw-color or are sometimes made black with a dye from Elder-berry stems.

CELASTRACEAE. STAFF-TREE FAMILY.

Shrubs with simple leaves. Flowers small, perfect, regular, with jointed pedicels. Calyx 5 (4 to 6)-lobed or parted. Petals 5 (4 to 6). Stamens as many as the petals, alternate with them and inserted on a very thick and conspicuous disk. Ovary 2 to 5-celled, immersed in or surrounded by the disk; styles united into one, or none; stigma 3 to 5-lobed. Fruit a loculicidal capsule, free from the calyx. Seed ariled, with large embryo and broad and thin cotyledons; endosperm fleshy.

1. **EUONYMUS** L. BURNING BUSH.

Leaves opposite, petioled, deciduous. Flowers purplish, in cymes on axillary peduncles. Petals inserted beneath the 5-lobed disk. Stamens inserted on the disk. Ovary 3 to 5-celled, the cells 2 to 6-ovuled; style short or none. Capsule 3 to 5-lobed, the cells 1 to 2-seeded. Seeds covered with a fleshy red aril. (Greek eu, good, and onoma, a name, used ironically by Theophrastus, the herbage reputed poisonous.)

1. ***E. occidentalis*** Nutt. WESTERN BURNING BUSH. Erect, slender, 6 to

18 ft. high, the branches 4-angled; leaves thin, ovate or often broadest above the middle and abruptly acuminate, serrulate, $1\frac{1}{2}$ to 4 in. long, on petioles 3 lines long; peduncles 1 to $1\frac{1}{2}$ in. long, 3 to 5-flowered; flowers 4 or 5 lines broad; calyx-lobes broad and obtuse; petals roundish, brownish purple, finely dotted and with scarious margins; capsule depressed, smooth, deeply 3-lobed, often $\frac{3}{4}$ in. broad.

Near the coast: Santa Cruz Mts. to Marin and Humboldt cos. June.

ACERACEAE. MAPLE FAMILY.

Deciduous trees or shrubs. Leaves opposite, petioled, simple or compound, without stipules. Flowers regular, polygamous or dioecious, borne in axillary or terminal racemes, corymbs or fascicles. Calyx 5 (or 4)-cleft. Petals 5 (or 4), or none. Stamens 3 to 10, borne on the edge of a disk or hypogynous. Ovary superior, 2-celled, 2-lobed, developing a long wing from the summit of each lobe and thus ripening into a double samara. Styles 2. Samaras separable at maturity, the wings serving to rotate them rapidly in the air and further their horizontal flight.

1. ACER L. MAPLE.

Flowers small, the clusters always drooping. (Latin name of the Maple tree.)

Flowers polygamous, the perfect and staminate mixed in the same raceme or the lower half of the raceme staminate; petals present; leaves simple.....1. *A. macrophyllum*.
Flowers dioecious, the staminate clustered, the pistillate in racemes; petals none; leaves compound2. *A. negundo*.

1. *A. macrophyllum* Pursh. BIG-LEAF MAPLE. Tree 20 to 80 ft. high; juice in young herbage milky; leaves simple, roundish in outline, 4 to 12 in. broad, palmately parted into 5 broad mostly 3-lobed or toothed divisions; petioles 2 to 10 in. long; racemes 2 to 5 in. long; flowers greenish or dull white; sepals elliptic, $2\frac{1}{2}$ lines long, equaled by the oblong petals; stamens 7 to 9, exceeding the sepals in the staminate flower; filaments villous below; body of samaras densely hispid, the wings 1 to $1\frac{1}{2}$ in. long and 6 to 8 lines wide.

Banks of streams and in the mountains, mostly on north and east slopes or in deep cañons: Sierra Nevada; Coast Ranges northward to southeastern Alaska. Mar. Also called Oregon Maple, California Maple, Water Maple and White Maple.

Two other species with simple leaves occur in the State. They are shrubs or small trees with flowers in corymbs and samaras glabrous: *A. GLABRUM* Torr. Sierra Maple. Leaves mostly 3-lobed or -parted; filaments glabrous.—High Sierra Nevada. *A. CIRCINATUM* Pursh. Vine Maple. Leaves shallowly but acutely 7 to 9-lobed; filaments hairy.—Humboldt Co. northward to Washington.

1. *A. negundo* L. var. *californicum* Sarg. BOX ELDER. Tree 20 to 60 ft. high; leaves pinnately 3-foliolate, the leaflets $1\frac{1}{4}$ to 5 in. long, serrate and incised, or deeply 2 or 3-lobed, or the lobes sometimes becoming distinct and petioled so that one or more of the primary leaflets is replaced by 2 or 3; staminate flowers clustered on thread-like hairy pedicels, the stamens 4 or 5; pistillate flowers borne in slender racemes; samaras straw-white, crimson when young, finely pubescent, the wings 6 to 8 lines long, 4 lines wide.

Along streams and in low moist valley bottoms: Ukiah, Napa and Sacramento valleys to Southern California; Sierra Nevada foothills. Not reported from the inner Coast Range. Some fine trees along Olema Creek. Mar.-Apr.

SAPINDACEAE. BUCKEYE FAMILY.

Deciduous trees or shrubs with opposite compound leaves, no stipules, and slightly irregular flowers. Ovary superior, 3-celled with 2 ovules in each cell, commonly but one ovule maturing. Endosperm none.

1. *AESCULUS* L. HORSE CHESTNUT.

Leaves palmately compound with serrate leaflets. Flowers showy, ill-scented, on jointed pedicels in a terminal cylindrical thyse, of two sorts, perfect (fertile) with long thick styles and sterile with short styles; fertile flowers few near top of thyse. Calyx tubular, unequally cleft. Petals 4 or 5, slightly unequal, clawed. Stamens 5 to 7, becoming successively much exerted and often unequal. Fruit a large 3-valved capsule releasing one large polished seed. (Latin name of an Italian oak with edible acorns.)

1. *A. californica* (Spach) Nutt. BUCKEYE. A low tree (commonly 10 to 15 ft. high) with a rounded or depressed crown of greater breadth; leaflets 5 to 7, oblong-lanceolate to oblong-elliptic, acute or acuminate, 3 to 5 in. long; thyse 4 to 6 in. long; petals 6 or 7 lines long, the elliptic or ovate limb rotately spreading; axis of the thyse at length naked and pendulous, bearing one pear-like pod or sometimes 2 to 9; seed 1 to 2 in. in diameter.

Low dry hills or cañon sides: Coast Ranges and Sierra Nevada. A beautiful tree when laden in June with its profusion of white flowers. Leaves and seeds regarded as poisonous to cattle.

STAPHYLEA BOLANDERI Gray, the Bladder-nut of the Sierra Nevada, is a shrub with 3-foliate leaves and a 3-celled 3-horned inflated pod $1\frac{1}{2}$ in. long.

RHAMNACEAE. BUCKTHORN FAMILY.

Shrubs or small trees with simple leaves and mostly caducous stipules. Flowers small, regular, commonly in little umbels, the umbels often aggregated in racemes or panicles. Calyx-lobes, petals and stamens 5 (or 4). Calyx-tube lined with a disk, the petals and stamens inserted on the edge of the disk and alternate with the calyx-lobes. Petals commonly clawed, sometimes wanting. Ovary 3 (or 2)-celled, free from or adnate by the disk to the base of the calyx. Style simple or 3-cleft. Fruit a berry or capsule.

Fruit fleshy, berry-like; calyx free from ovary.....1. *RHAMNUS*.

Fruit dry, capsular; calyx adnate to base of ovary.....2. *CEANOTHUS*.

1. *RHAMNUS* L. BUCKTHORN.

Shrubs with alternate leaves. Flowers small, greenish, perfect or polygamous, in axillary clusters. Calyx with 4 or 5 short lobes or teeth. Petals very small, hooded and without claws, or none. Stamens 4 or 5; filaments short. Ovary ovoid, free. Fruit berry-like, containing 2 or 3 separate seed-like nutlets of bony or cartilaginous texture. (The ancient Greek name.)

Deciduous shrubs; flowers complete; leaves thinnish, 3 to 6 in. long....1. *R. purshiana*. Evergreen shrubs; leaves thickish, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long.

Petals present; berry black.....2. *R. californica*.

Petals none or very minute; berry red.....*R. crocea*.

1. *R. purshiana* DC. CASCARA SAGRADA. Small tree or shrub 8 to 20 ft. high; leaves in a tuft at end of branchlets, thinnish, deciduous, elliptic-oblong, obtuse or slightly cordate at base, obtuse or abruptly blunt-pointed at apex, serrulate, mostly 3 to 6 in. long; petioles tomentulous; flowers 5-merous; berry black, with 3 (or 2) nutlets.

Mendocino and Humboldt cos. and northward to Washington. In Sonoma and Mendocino cos. are transition bodies which suggest a shading into the

next species. *R. californica* in that region is tall, up to 14 ft. high, and has large broad leaves which simulate closely the foliage of certain shrubs which though evergreen are considered to be forms of *R. purshiana*. True *R. purshiana* in the North Coast Ranges flowers early and its berries are half grown in June at the time typical *R. californica* is in flower. Cascara Sagrada bark is extensively collected in Oregon and Washington for use in drug manufacture.

2. *R. californica* Esch. COFFEE BERRY. Evergreen shrub commonly 4 to 6 ft. high; leaves scattered along the branchlets, narrowly or broadly oblong, usually acute, glabrous or slightly puberulent, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; flowers mostly perfect, on short pedicels in an umbellate peduncled cluster, the peduncles short ($\frac{1}{2}$ in. long) to none; calyx $1\frac{1}{2}$ to $2\frac{1}{2}$ lines broad, its lobes triangular-lanceolate; petals minute, hooded, deeply emarginate; berry black, globose or oval, 3 to 4 lines in diameter, containing 2 (rarely 3) nutlets.

Common everywhere in the Coast Ranges and at low altitudes in the Sierra Nevada. June-July. Fr. Sept.-Oct. Also called Pigeon Berry and Yerba del Oso. Var. *TOMENTELLA* Brew. & Wats. Leaves varying to elliptic, usually conspicuously feather-veined, finely tomentose on the under side or even silvery.—Santa Cruz Mts.; Mt. Hamilton Range; Sierra Nevada foothills. Leaves very olive-like.

3. *R. crocea* Nutt. RED-BERRY. Low densely branched glabrous shrub $\frac{1}{2}$ to 2 or 3 ft. high, the branchlets rigid or even spinescent; leaves often fascicled, elliptic, firm coriaceous, 1 to 5 lines long, serrulate, green above, yellowish beneath, very shortly petioled; flowers mostly polygamous, 4-merous; petals none or minute; berry 2 or 3 lines long, red, containing 2 (rarely 3) nutlets.

Napa Range and southward near the coast to Southern California, etc. Feb.-May. Var. *ILICIFOLIA* Greene. Tree-like with a distinct trunk, or the stems several and clustered, 5 to 12 ft. high; branchlets rather stout; leaves oval to orbicular, often golden beneath, spinulose-dentate, 7 to 12 lines long; sepals and stamens frequently 5; berry bright red, ovoid, $2\frac{1}{2}$ lines long.—Inner Coast Range (Vaca Mts., Mt. Diablo) and southward to Southern California. Fr. Sept.

2. CEANOTHUS L. MOUNTAIN LILAC.

Shrubs or small trees with petioled leaves, the branchlets often divaricate and rigid, sometimes spinescent. Flowers small but showy, borne in panicles or umbels. Calyx 5-lobed, the lower part adnate with the thick disk to the lower part of the 3-celled ovary. Petals 5, hooded by the inflexion of the acuminate apex, and with long claws. Stamens 5, filaments filiform, long-exserted. Style 3-cleft. Capsule subglobose, 3-celled, 3-lobed, becoming dry and separating into its 3 carpels, these elastically dehiscent along the inner edge and dispersing the seeds. Seeds obovate, convex on the back. (Greek *Keanothus*, name used by Dioscorides to designate some spiny plant. All of our species are evergreen except *C. integerrimus* and possibly *C. parryi*.)

A. Leaves alternate.

Fruit smooth or at most crested, never with horns; stipules thin or membranous, fugacious or deciduous; flowers in umbellate fascicles, the fascicles collected in simple or compound racemes or panicles.

Branches flexible, not spinescent.

Flowers white; leaves plane.

Inflorescence compound; leaves very strongly 3-nerved beneath, $1\frac{1}{2}$ to 3 in. long; fruit slightly crested.....1. *C. velutinus*.

Inflorescence simple or compound; leaves entire, $\frac{1}{2}$ to 1 in. long; fruit crestless...2. *C. integerrimus*.

Flowers blue (rarely varying to white); inflorescence compound.

Leaves plane, mostly 1 to $2\frac{1}{2}$ in. long, strongly 3-nerved, serrulate.....3. *C. thyrsiflorus*.

- Leaves similar, pinnately veined, but the margins revolute, seemingly entire, and sometimes concealing the supplementary lateral nerves.....4. *C. parryi*.
 Flowers blue, the clusters in a simple raceme mostly $\frac{1}{2}$ to 1 in. long; leaves mostly rather small, usually not 3-nerved.
 Leaves subcoriaceous, with smooth waxy surface, the margin very glandular-serrate5. *C. foliosus*.
 Leaves papillate near the revolute margin.....6. *C. dentatus*.
 Leaves similar, but glandular-papillate on the entire upper surface.....7. *C. papillosus*.

Branches more or less rigid and spinescent.

- Leaves glandular-denticulate; flowers deep or very light blue, in a simple raceme; branchlets stiff8. *C. sorediatus*.
 Leaves entire; flowers white, in a simple or paniculately compound raceme; branchlets thick and stout, spur-like, very glaucous; fruit warty-roughened; leaves strongly 3-nerved9. *C. incanus*.

B. Leaves opposite.

Fruit with conspicuous dorsal horns; stipule-bases warty or cork-like and persistent; flowers in simple umbels.

Erect shrubs.

- Flowers white; leaves entire.....10. *C. cuneatus*.
 Flowers blue; leaves finely spinose-dentate on the upper half.....11. *C. rigidus*.
 Flowers blue (or white); leaves rather coarsely spinose-dentate.
 Branchlets gray; pedicels 2 lines long.....12. *C. jepsonii*.
 Branchlets reddish or brownish; pedicels 5 to 7 lines long.....13. *C. purpurea*.
 Low-spreading shrub; flowers blue; leaves coarsely few-toothed toward the apex.....14. *C. prostratus*.

1. *C. velutinus* Dougl. Large shrub 8 to 12 ft. high, the branches mostly ascending; odor very sweet and heavy; leaves elliptic or ovate, rounded or subcordate at base, finely glandular-serrate, pale and strongly 3-nerved beneath, varnished above and frequently of a rich chocolate-brown, $\frac{1}{2}$ to 3 in. long, on petioles $\frac{1}{2}$ in. long or less; panicle 2 to 3 in. high; flowers white, 2 lines broad; capsules smooth, lobed at top, nearly crestless, sticky-glandular.

Mt. Shasta; Modoc Co.; and the northern Sierra Nevada. Often called Snow Brush. Var. *LAEVIGATUS* T. & G. Subarborescent; leaves glabrous, light green; inflorescence more ample; fruit somewhat crested.—Mt. Tamalpais, Mt. St. Helena and northward in the Coast Ranges to Mendocino and Humboldt cos.

2. *C. integerrimus* H. & A. DEER-BRUSH. Tall shrub, 10 to 15 ft. high; twigs green or at length purplish, subangular when young; leaves deep green above, paler beneath, oblong-elliptic, obtuse, mostly acute at base, entire, $\frac{1}{2}$ to 1 in. long; inflorescence simple and about 2 in. long, or compound and about 4 in. long, or in fruit twice as long, equaled by the leafy (or often nearly leafless) peduncles; flowers white (sometimes blue or pink); capsules nearly globose, lobed, smooth, crestless.—(*C. californicus* Kell.)

Common in the Yellow Pine belt of the Sierra Nevada or immediately below it. Found in the Santa Cruz Mts., Mayacamas Range and frequent northward to Mt. Shasta. June-July. Favors good soils.

3. *C. thyrsoflorus* Esch. BLUE BLOSSOM. Shrub 5 to 8 ft. high or becoming a small ungainly or pole-like tree up to 15 to 25 ft. high; leaves green on both surfaces, elliptical or oblong-ovate, strongly 3-nerved beneath, the margin mucronate-serrate or serrulate with somewhat impressed teeth, 1 to $2\frac{1}{2}$ in. long, 6 to 10 lines broad; inflorescence a panicle of somewhat corymbose racemes, $1\frac{1}{2}$ to $2\frac{3}{4}$ in. long, mostly long-peduncled, with leaves subtending 1 or 2 of the lower racemes; bractlets ovate, acuminate, $2\frac{1}{2}$ lines long; flowers blue or sometimes varying to white; capsules globose, black, smooth, little lobed, 2 lines in diameter.

Abundant near the coast, following strictly the Redwood belt: Santa Lucia Mts.; Monterey; Santa Cruz Mts.; San Francisco; Marin Co. to Del Norte Co., thence north to Washington. Sometimes forming flat mats on ocean bluffs.

Feb.-Apr. Also called "Mountain Lilac," "California Lilac" or simply "Lilac." Appears in great abundance on logged Redwood lands.

4. **C. parryi** Trelease. PARRY LILAC. Spreading shrub, 4 to 6 ft. high; branchlets angular and, when young, tomentose, the 1-year-old ones reddish; leaves pinnately veined, narrowly to broadly oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, dark green above, loosely tomentose beneath, the margin denticulate, seemingly entire because soon revolute and thus concealing the teeth and also the lateral supplementary nerves; petioles 2 lines long; panicle oblong or distinctly broader below, 1 to 3 in. long, on sparsely leafy peduncles twice as long; flowers blue; capsules globose, smooth, 2 lines in diameter.

Mountain slopes: Napa and Mt. Hood ranges to western Mendocino and Humboldt. The most handsome species of the genus when in full flower in May. Grows up to 18 ft. high in the Redwoods near Camp Grant.

5. **C. foliosus** Parry. Low shrub commonly dense at base, with horizontally spreading or diffuse branches 2 to 4 ft. long; bark of main stem bright green; branchlets rather long and straight and rather ascending; lightly pubescent, especially on the branchlets; leaves broadly oblong, undulate or somewhat infolded longitudinally, 3 or 4 (or the larger 6) lines long, frequently with smaller ones fasciated in their axils; upper surface dark green, lower glaucous, the teeth of the margin bearing conspicuous glands; petiole distinct but very short; peduncles rather long, bearing a globose or short-oblong raceme $\frac{1}{2}$ to 1 in. long; flowers blue, 1 to $1\frac{1}{2}$ lines broad; capsules $1\frac{1}{2}$ lines broad, smooth, crested.

Rather common in the seaward and middle Coast Ranges north of San Francisco Bay: Mt. Tamalpais; Sonoma; Howell Mt.; Mt. St. Helena, and northward through the Redwood belt of Mendocino Co., where pure thickets occur near Kennys, some of the individuals up to 16 ft. high. Apr.-May.

6. **C. dentatus** T. & G. Low densely branched shrub with reddish brown branchlets, the young twigs tomentose; leaves elliptical or narrower, rounded at both ends or appearing retuse or subtruncate from the infolding of the apex, dark brown and waxy on the upper surface, light colored and pubescent beneath, papillate on and near the margin, 2 to 6 lines long; inflorescence subglobose, very tomentose; flowers blue; capsules slightly crested, scarcely lobed, 2 lines in diameter.

Santa Cruz Mts. to Monterey.

7. **C. papillosus** T. & G. Habit of the last and differing little from it; leaves often slightly cordate at base, the whole upper surface closely glandular-papillate, 1 in. long or less, sometimes as much as 2 in. long; inflorescence more oblong, about 1 in. long; peduncles naked, solitary or clustered; capsules rather less than 2 lines in diameter.

Santa Cruz Mts. south to the Santa Lucia Mts.

8. **C. sorediatus** H. & A. Erect shrub 4 to 7 ft. high with rigid divaricate branchlets; branchlets sparingly villous, at length olive-color or purplish; leaves ovate or elliptic-ovate, green above, paler and slightly pubescent beneath with appressed hairs, glandular-denticulate, $\frac{1}{4}$ to 1 (or $1\frac{1}{2}$) in. long, on petioles a line or two long; racemes 1 or 2 (terminal or subterminal) on each branchlet, ovate or broadly oblong in outline, $\frac{1}{2}$ to 1 in. long; flowers blue or almost white; capsules lobed, crested, 2 to $2\frac{1}{2}$ lines in diameter.

Common in the Coast Ranges, at flowering time often coloring the north cañon sides: Vaca Mts.; Mt. Hood Range; Howell Mt.; Mt. Tamalpais; Oakland Hills; Mt. Diablo; and southward. Mar.-Apr.

9. **C. incanus** T. & G. Shrub 8 to 12 ft. high with very white-glaucous

branches and branchlets, the latter more or less modified into thick stout thorn-like spurs; leaves elliptic to ovate, acute or obtuse, rounded at base, light colored above, strongly 3-nerved and whitish or pale beneath, 1 to $1\frac{1}{2}$ in. long; petioles 2 or 3 lines long; inflorescence finely velvety, 2 or 3 in. long or less; flowers white; capsules thickly warty, shallowly lobed at top, $2\frac{1}{2}$ lines in diameter.

Brushy openings or peaks in the Redwood belt from the Santa Cruz Mts. to Mt. St. Helena and northward through the Redwoods of Mendocino and Humboldt cos., less common or absent eastward in the "Bald Hills" country. Called "White Thorn" in southwestern Humboldt.

C. *CORDULATUS* Kell. Snow Brush. Low flat-topped spreading shrub, with whitish twigs and spinose branchlets; leaves broadly elliptic, cuneate to subcordate at base, 6 to 9 lines long, dark green above, minutely puberulent; flowers white, in short racemes.—Sierra Nevada, very abundant at 6000 to 9000 ft., forming open thickets.

10. C. *cuneatus* Nutt. BUCK BRUSH. Rigid divaricately branched shrub of a gray-blue hue, 5 to 8 ft. high; bark whitish; branchlets stout and short, those on a branch often very unequal and frequently interruptedly disposed; leaves oblong-obovate to broadly obovate, entire, green above, paler beneath, 4 to 6 (or 11) lines long, on very short petioles; umbels 6 to 9 lines broad; pedicels 2 to 4 lines long; flowers white; capsules slightly oblong, $2\frac{1}{2}$ lines long, with three short erect horns.

Very abundant on dry or rocky slopes in the higher Coast Ranges and in the Sierra Nevada foothills, either isolated, or gregarious and one of the constituents of the chaparral. Also called Blue Brush. Chaparral consists of Manzanita, Pickeringia, Buck Brush, Scrub Oak or similar shrubs which form impenetrable and extensive thickets clothing densely the higher slopes and ridges of the Coast Ranges, and the foothills and middle altitudes of the Sierra Nevada. Mar.-Apr.

11. C. *rigidus* Nutt. Shrub 4 to 6 ft. high, rigidly and intricately branched; leaves opposite and crowded, cuneate-obovate, mostly retuse, firm but rather thin, soon nearly glabrous on both surfaces, the apical half finely spinose-dentate, 2 to 6 lines long, nearly sessile; stipules conspicuously warty; flowers bright blue; capsules a little larger than in no. 10.

Rare: Mt. Tamalpais and Bolinas Ridge to Monterey.

12. C. *jepsonii* Greene. Rigid erect shrub about 4 to 5 ft. high; branchlets short, stubby, gray; leaves elliptic-oblong, spiny-toothed, undulate-margined or somewhat infolded longitudinally, 4 to 9 lines long; stipules small; flower-clusters small, the pedicels 2 or 3 lines long; flowers white or blue, exhaling a musky odor.

Mt. St. Helena; Howell Mt.; Marin Co. Feb.-May.

13. C. *purpurea* Jepson. Erect shrub 4 or 5 ft. high with brownish or reddish branchlets; leaves very thick, orbicular, 1 in. long or less, glabrous, shining and light green above, paler beneath with a closely appressed tomentum, coarsely and pungently toothed all around; stipules very large; flowers large, purple; pedicels 5 to 7 lines long; fruit unknown.

Napa Range. May. Nearly allied to C. *CRASSIFOLIUS* Torr. (San Diego Co. northward to the Santa Inez Mts.) which has elliptic-obovate leaves with more finely toothed or subentire revolute margin, the upper surface roughened, the lower surface densely white tomentose; capsules subglobose, with 3 stout suberect horns near the top, 3 to 4 lines in diameter.

14. C. *prostratus* Benth. MAHALA MATS. Branches prostrate, rooting,

thickly matting the ground; branchlets often reddish, at first pubescent; leaves green on both surfaces, glabrous or finely flocculent-pubescent beneath, thick and firm, cuneate-obovate, coarsely and pungently 3-toothed at the apex, and commonly with 1 or 2 similar teeth at or above the middle; flowers blue; fruit globose, not lobed, with 3 large wrinkled horns on each valve and 3 intermediate crests, 3 to 4 lines long.

Sierra Nevada, where it is common, covering the ground with broad green patches in the Yellow Pine (*Pinus ponderosa*) woods; Mt. Shasta; southward in the North Coast Ranges through the Yollo Bolly Mts. and Snow Mt. to Cobb Mt. where it passes into the following: Var. *DIVERGENS* Brandegee. Low scrambling shrub with horizontally spreading, trailing or almost procumbent branches; leaves more dentate-spinose than in the type, almost sessile, 4 to 6 lines long; flowers blue; capsules about 3 lines in diameter, with the horns more lateral.—Mt. St. Helena; Sonoma; Marin Co.; Santa Cruz Co. May.

THYMELAEACEAE. MEZEREUM FAMILY.

Our deciduous shrubs with simple entire alternate leaves and no stipules. Flowers perfect, with corolla-like shallowly 4-cleft calyx. Stamens inserted upon the calyx, twice as many as its lobes. Corolla none. Ovary superior, 1-celled; ovule 1, pendulous.

1. DIRCA L. LEATHERWOOD.

Flowers in fascicles from buds containing flowers and leaves. Scales of the bud yellowish or whitish, silky, forming an involucre to the flowers, caducous. Calyx slightly oblique, tubular below, expanded into a short throat above. Stamens 8, 4 exerted, the alternate shorter, inserted at the base of the throat. Style slender, exceeding the stamens. Fruit drupe-like, reddish. (Classical Greek name of a celebrated fountain in Boeotia, the plants growing in moist places.)

1. *D. occidentalis* Gray. WESTERN LEATHERWOOD. Erect shrub 2 to 4 feet high, with very tough stems and leathery bark; leaves oval or obovate, $1\frac{1}{2}$ to 2 inches long; flowers yellow, in clusters of 2 or 3 from lateral and terminal buds, nodding; calyx 4 lines long.

Coast Ranges near the sea: Santa Cruz, acc. Dr. Anderson, Pilarcitos, C. T. Blake, 1893, and north to Marin Co., acc. Greene. Oakland Hills (type loc. Dr. J. M. Bigelow), north slopes in cañons. Feb.-Mar.

VITACEAE. VINE FAMILY.

Woody plants, mostly climbing by tendrils. Leaves in ours simple, alternate. Flowers small, regular, greenish or whitish, in a compound thyrse. Calyx minute, the limb mostly obsolete and truncate. Petals 5 (4 or 6), valvate, caducous or early deciduous, the stamens as many and opposite them. Fruit a 2-celled berry. Seeds with a thick and bony testa. Embryo minute, in a tough endosperm.

1. VITIS L. GRAPE.

Leaves opposite the tendrils or flower clusters. Tendrils at least once branched. Calyx-tube filled with the disk, which bears the stamens and petals. Ovules 2 in each cell. (Classical Latin name.)

1. *V. californica* Benth. CALIFORNIA WILD GRAPE. Leaves roundish, tomentose, especially beneath, the tomentum in age flocculent, 2 to $5\frac{1}{2}$ in. broad, coarsely or minutely dentate, cordate at base with open or closed sinus, slightly or not at all lobed, or frequently with a sinuately 3 to 5-

lobed leaf at the next node above or below an unlobed one; fruit purple, with a bloom, 3 to 5 lines in diameter.

Along streams throughout the Coast Ranges, Sacramento and San Joaquin valleys, and Sierra Nevada foothills. Climbing trees, especially Oaks and Cottonwoods, and frequently killing such by covering them with its drapery of leaves. Very fragrant at flowering time (May-June) with a pleasant sweet odor. Main trunk sometimes $1\frac{1}{2}$ ft. in diameter (Col. C. C. Royce, Chico.).

MALVACEAE. MALLOW FAMILY.

Herbs or soft-woody shrubs with mucilaginous juice, tough fibrous inner bark, and usually stellate pubescence. Leaves alternate, simple, palmately veined and commonly lobed, stipulate. Flowers commonly perfect, sometimes polygamous or dioecious, regular. Calyx with 5 lobes, valvate in the bud, often with an involucre of bractlets at base, persistent. Petals 5, twisted in the bud. Stamens indefinite, hypogynous, monadelphous in a column or tube around the pistils, the petals inserted on the base of the tube. Pistil 1, composed of several to many carpels, the superior ovary commonly with as many cells as styles or stigmas. Fruit a loculicidal capsule, or the carpels separating at maturity.

Anthers scattered along the outside of the tube of filaments; ovary 1, 5-celled; fruit a loculicidal capsule1. HIBISCUS.

Anthers borne in a cluster at the top of the tube of filaments; carpels several, crowded and united around a central axis, separating at maturity.

Styles stigmatic lengthwise on the inside; herbs.

Bractlets 3, distinct, inserted on the calyx.....2. MALVA.

Bractlets none, or one and inserted at base of calyx.....3. SIDA.

Styles with terminal stigma; bractlets slender or even filiform.

Flowers roseate, rose-purple or white; mostly shrubs or suffrutescent plants.....4. MALVASTRUM.

Flowers cream-color; low decumbent herb.....5. SIDA.

1. HIBISCUS L. ROSE-MALLOW.

Stout herbs. Flowers showy, in ours solitary on the subterminal peduncles. Involucre consisting of numerous slender bractlets. Stamen column with anthers scattered along the upper part but naked at the truncate 5-toothed summit. Ovary 5-celled with 2 to many ovules in each cell. Capsule loculicidal. (Greek name for the Marsh Mallow, used by Dioscorides.)

1. *H. californicus* Kell. Stems pubescent, cane-like, 3 to 7 ft. high; leaves cordate, dentate, acuminate, $2\frac{1}{2}$ to 3 in. long from the summit of petiole to apex of leaf, and about as broad; petioles $1\frac{1}{2}$ or 2 in. long; bractlets and valves of capsule ciliate; peduncles 2 or 3 in. long, jointed near the middle, united with the petiole at base; calyx campanulate, cleft to the middle, conspicuously nerved at maturity and filled by the capsule; corolla white or roseate, with deep crimson center, 3 to 4 in. long; capsule exceeding 1 in. long; seed minutely papillate.

Low marshy places along the Sacramento and San Joaquin rivers.

LAVATERA ASSURGENTIFLORA Kell. Tree Mallow. Shrub with ample maple-like leaves and showy rose-colored axillary flowers subtended by a 2 to 3-lobed involucre; anthers scattered; fruit a depressed whorl of smooth carpels.—Commonly cultivated at San Francisco and said to be naturalized.

2. MALVA L. MALLOW.

Ours annuals or biennials. Involucre of 3 distinct bractlets, inserted on the base of the calyx. Calyx cleft to the middle into 5 broad lobes. Petals whitish

or rose-color, obovate or emarginate. Style-branches 10 or more, subulate. Fruit a depressed whorl of carpels, separating from the central axis when ripe as 1-seeded achene-like nutlets, which are round-reniform and completely filled by the seed. (Greek malache, soft, on account of the emollient properties. Ours naturalized Old World weeds of waste places.)

Petals much surpassing the calyx.

- Carpels not reticulate, puberulent on back.....1. *M. rotundifolia*.
 Carpels glabrate at maturity, rugose-reticulate on back, the margin entire or obscurely denticulate; calyx-lobes mostly closed over the mature fruit.....2. *M. borealis*.
 Petals slightly longer than the calyx; carpels rugose-reticulate on back, the margin winged and denticulate; calyx-lobes spreading or erect.....3. *M. parviflora*.

1. *M. rotundifolia* L. DWARF MALLOW. Sparsely hispidulous or hirsute; stems slender, procumbent, 1 to 2 ft. long, from a large deep root; leaves rounded, crenate, slightly or scarcely at all 5 to 7-lobed; corolla surpassing the calyx, pale blue; carpels 14 or 15, puberulent, not reticulated on the back or at least not obviously so.

Waysides and old gardens at Berkeley. Summer and autumn.

2. *M. borealis* Wallm. BULL MALLOW. Habit and foliage like the preceding, but herbage often more hairy; pedicels tending to be reflexed in fruit; bractlets ovate or lanceolate; calyx-lobes mostly closed over the mature fruit; corolla pinkish, 5 to 6 lines long, surpassing the calyx; carpels dorsally rugose-reticulate or even somewhat favose, the margin entire or obscurely denticulate.

Common at Berkeley and other Bay towns, flowering during the summer into early winter.

3. *M. parviflora* L. CHEESE-WEED. Widely branching, 1½ to 3 ft. high; petioles and ascending branches stellate-hairy on the upper side, glabrous below; leaves roundish in outline, with a red spot at base of blade, shallowly 7-lobed, 5 in. broad or less, on petioles twice as long as the blade; flowers in rather close axillary clusters; bractlets linear; corolla pinkish with notched petals, 2½ lines long, slightly longer than the calyx; calyx commonly spreading under or about the mature fruit; carpels about 11, sharply rugose-reticulate and pubescent on the back, the margin winged and denticulate.

Very common in waste places, especially near dwellings in the interior valleys; flowering in spring and early summer. All of our species are called "Cheeses" by children on account of the peculiar fruit. Useful as a dry fodder when dead ripe.

3. *SIDALCEA* Gray.

Herbs. Leaves rounded and either crenate, crenately incised, parted or divided, or palmately lobed. Flowers in terminal spikes or racemes, either perfect, gynodioecious (*i. e.*, with perfect and pistillate flowers on separate plants, the pistillate flowers being smaller and with sterile stamens) or dioecious. Corolla purple, rose-pink or white. Bractlets in ours none, rarely 1. Petals emarginate or truncate. Stamen-tube with double series of terminal free filaments, the filaments of the outer series often distinctly below the filaments of the inner series; filaments more or less united into sets. Fruit consisting of 5 to 9 carpels, commonly beaked. (*Sida*, a genus of this family, and *Alkea*, ancient name for a mallow, alluding to the appearance and relationship of these plants.)

Leaves round in outline, at least some (usually the upper) pedately parted or divided; flowers in ours rose-pink or purple.—*EUSIDALCEA*.

Petals truncate or merely retuse; annuals except no. 4.

Carpels rugose-reticulate on back and

Beakless; pubescence both stellate and hispid-pilose, especially on calyx; bracts

- foliaceous, palmately divided into filiform segments.....1. *S. diploscypha*.
 Tipped with a soft and hairy, at length deciduous beak; flowers minutely bracteate;
 herbage mainly stellate-pubescent.....2. *S. hartwegii*.
 Carpels longitudinally grooved or striate-nerved on back.
 Slender annual; stipules 1 to 2 lines long.....3. *S. sulcata*.
 Stout perennial; stipules 3 to 6 lines long.....4. *S. calycosa*.
 Petals deeply emarginate; perennials.
 Raceme mostly loose, terminating a simple stem; flowers gynodioecious; carpels slightly
 rugulose-reticulate5. *S. malvaeflora*.
 Stem commonly branching, the terminal spikes dense; flowers perfect; achenes
 smooth on back.....6. *S. oregana*.
Leaves vitiform, angulately 5 to 7-lobed, none parted or divided; flowers white; perennial.—
 HESPERALCEA.
 Flowers dioecious or subdioecious; spikes short and dense, paniced; carpels smooth....
 7. *S. malachroides*.

1. ***S. diploscypha*** (T. & G.) Gray. Annual, erect and simple, or more robust and branching, 7 to 20 in. high, pilose-hispid, and also with a minute stellate pubescence; radical leaves more or less deeply crenate, the cauline parted and 2 to 3-cleft, the bracteal filiform divided; flowers on short pedicels in umbellate clusters at the ends of the branches; calyx-lobes lanceolate-subulate; petals nearly 1 to 1¼ in. long, minutely erose-denticulate; filaments of the outer series united nearly to the summit into sets of 5 to 10; carpels nearly orbicular, dorsally reticulate; receptacle at separation of the achenes marked by as many obtuse longitudinal processes as there are carpels.

Open valley fields or low hills: Sacramento Valley; Coast Range valleys from Humboldt and Sonoma cos. southward to Mt. Diablo and Newark. May. Var. MINOR Gray. Flowers tending to be disposed in lax spicate racemes; corolla with a dark purple center, about ¾ in. long; carpels rugose.—Sacramento Valley.

2. ***S. hartwegii*** Gray. Slender annual, sparingly branched, about 1 ft. high, sparsely stellate-pubescent or almost glabrous below, but scarcely or not at all hispid; leaves pedately 5 to 7-divided into linear entire divisions or the lower with broader trifid divisions; flowers few in a short spike; filaments of the outer series closely approximating the inner, more or less united in pairs or sets as in the perennial species; corolla rose-purple, 6 to 8 lines long; carpels strongly incurved, foveously rugose-reticulate.

Sierra Nevada foothills: Butte Co. to Calaveras Co. (and Mariposa Co. acc. to Syn. Fl.) North Coast Ranges near Rutherford. May.

3. ***S. sulcata*** Curran. Annual, slender, unbranched, or sparingly branched, 11 to 14 in. high; leaves small (mostly ¾ in. long or less), the lower crenate, the upper divided into about 6 often narrowly linear divisions; stipules 1 to 2 lines long; raceme spike-like or loose, few-flowered; calyx purplish, sparingly hairy, its lobes narrowly ovate, acuminate; corolla 8 or 9 lines long.

Petaluma; northern Sierra Nevada foothills. May-June. Perhaps too near the next.

4. ***S. calycosa*** M. E. Jones. Perennial; rootstocks creeping, branched; stems green or purplish, very succulent, decumbent and rooting freely below, 1½ to 2½ ft. high; herbage glabrous below or sparingly hirsute above; radical leaves 3 to 4 in. broad, crenately but shallowly incised; cauline leaves divided into about 8 or 9 broadly cuneate divisions; stipules round or ovate, acuminate, or obtuse and toothed, green or purple, 3 to 6 lines long; flowers in terminal short spikes; calyx rather densely covered with sandy-brown hairs, its lobes ovate, acuminate, 3 to 6 lines long; corolla 1 in. long, lilac; carpels grooved in the back or with the grooves sparingly interrupted transversely, minutely reticulate on the sides, the slender beak weak but persistent.

Pt. Reyes; Sonoma Co. acc. to Syn. Fl.; rarely collected.

5. *S. malvaeflora* (Moc. & Sesse) Gray. CHECKER-BLOOM. Stems erect (half-decumbent at the very base), $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, several from a woody perennial root, simple or rarely branched, retrorsely-hispid below with scattered hairs, above slightly stellate-pubescent; basal leaves crenate or crenately incised or cleft into cuneate-obovate 2 to 4-toothed lobes; upper leaves palmately twice cleft into linear or narrowly oblong divisions; raceme rather loose, 3 or 4 in. to 1 ft. long; bracts ovate, herbaceous, often notched at apex; flowers of two sorts:—one perfect with large corollas, the other pistillate with small corollas; corolla of perfect flowers 8 to 12 lines long, the outer series of filaments united for about half their length into sets of 4 or 2, the inner filaments mostly distinct; corolla of pistillate flowers 5 to 7 lines long, the filaments destitute of good anthers; carpels rugulose-reticulate, at least on the sides.—(*S. delphinifolia* Nutt. and *S. humilis* Gray.)

High places of open fields in the valleys and on the plains, or in the foothills. Apr.-May. Often called Wild Hollyhock.

6. *S. oregana* (Nutt.) Gray. Stems few from a stout thick root or woody crown, erect, $1\frac{3}{4}$ to $3\frac{1}{4}$ ft. high, nearly naked above, and either simple or paniculately branched; leaves round in outline, shallowly cleft or toothed, the lobes obtuse; cauline leaves incisely parted with the lobes toothed or cleft, or the uppermost pedately divided into 5 to 7 lanceolate or linear mostly entire divisions; spikes dense, oblong, 1 to 2 in. long, long-peduncled; bracts narrowly linear or subulate; calyx-lobes ovate, acute, about as long as the tube; corolla rose-pink, 5 or 6 lines long; carpels semi-orbicular, slightly beaked, 1 line long, glabrous and smooth, or slightly wrinkled on the sides near the dorsal angle.

High mountains of Sonoma and Napa cos. to Mt. Shasta and northward. July-Sept.

7. *S. malachroides* Gray. Stems stout, equally leafy to the summit, several from a perennial root, simple below, ending above in a panicle of white flowers in short dense spikes, or the panicle supplemented by some very slender peduncle-like branches from the upper axils, each terminated by a spike; herbage stellate-hispidulous; leaves palmately but shallowly lobed, unequally dentate, 1 to 6 (mostly 2 to 3) in. broad; bracts linear or subulate; calyx-lobes ovate, acuminate; staminate flowers with the filaments of the outer series united for about $\frac{1}{2}$ their length or less into pairs, or two such pairs slightly united by their bases making a set of 4; carpels sometimes present; pistillate flowers 3 to $3\frac{1}{2}$ lines long, the tube of filaments short, more or less truncate and without anthers; carpels 7 to 9, half dehiscent by a dorsal suture.

Seaboard species from the Santa Lucia Mts. and Santa Cruz northward to Humboldt Co. and Crescent City.

4. MALVASTRUM Gray. FALSE MALLOW.

Herbs or shrubs, ours mostly hoary-tomentose or canescent, with commonly angular leaves. Flowers solitary or more commonly in narrow subpaniculate racemes. Bractlets present (in ours), slender or filiform. Carpels 5 or more, 1 to 3-seeded, the fruit often dehiscent and 2-valved. Seed ascending. (*Malva*, Mallow, and aster, disparaging Latin suffix, not genuine or true.)

Flowers solitary on long slender peduncles; petals white or rose-color; annual.....

1. *M. exilic.*

Flowers in subpaniculate racemes; perennials.

Herbage densely stellate-tomentose.

Leaves pentagonal or roundish; petals rose-color; suffrutescent.....2. *M. fremontii.*

Leaves ovate; petals yellow; shrub.....3. *M. arcuatum*.
Herbage finely stellate-canescens; petals rose-color; shrub.....4. *M. fasciculatum*.

1. *M. exile* Gray. Herbage with a short stellate pubescence, and often with some longer spreading hairs; stems branching from the base, diffuse or decumbent, 4 or 5 in. to 1½ ft. long; leaves palmately 3 to 5-cleft, the lobes commonly laciniately toothed; flowers of different plants of two intergrading sorts, one chiefly pistillate with small white or rose-colored corollas (3 to 5 lines long), the other perfect and with much larger rose-colored corollas (6 to 10 lines long); calyx with an involucre of 3 slender bractlets; calyx-lobes ovate, very slenderly acuminate or even subulate; carpels strongly rugose.

San Joaquin Valley westward to Monterey Co. and southward to Southern California. Apr.-June. (Cf. Zoe, v, 144.)

2. *M. fremontii* Torr. Woody at base, stout, 2 to 3 ft. high, densely white-tomentose; leaves very thick, round-ovate, shallowly 5 to 7-lobed, crenate, 2 to 4 in. broad, on petioles ½ to 1 in. long; flower-clusters sessile in the axils or short-peduncled, interrupted-spicate at summit of stem; calyx ovate, densely and closely woolly, only the tips of the lobes visible, almost equaled by the 3 linear-setaceous bractlets of the involucre; corolla rose-color, 7 or 8 lines long; carpels thin, smooth, promptly dehiscent.

Mt. Diablo; Corral Hollow. June. Var. *CERCOPHORUM* Robinson. Calyx 7 to 9 lines long, its lobes lance-linear and caudate-attenuate, nearly or quite equaling the petals.—Arroyo del Valle, Alameda Co. June.

3. *M. arcuatum* (Greene) Robinson. Shrub 6 to 8 ft. high, with virgate terete branches covered with a dense or felt-like white tomentum; leaves ovate to ovate-orbicular, little or not at all lobed, truncate at base, more or less rugose, canescent-tomentose beneath, becoming green above, dentately toothed, ¾ to 2 in. long, on petioles, ½ to ¾ as long; flower-clusters sessile in the upper axils and at the ends of the branches, forming long interrupted unilateral spikes; bractlets linear-filiform, equaling the tomentose calyx; petals rose-color, 7 to 9 lines long.

Santa Cruz Mts. from near Belmont to Los Gatos, thence east to Evergreen.

4. *M. fasciculatum* (Nutt.) Greene. Shrub 5 to 10 ft. high, with long slender wand-like branches; pubescence short and close; leaves round-ovate, irregularly or obscurely lobed, crenate, mostly truncate or subcordate at base; flowers in sessile or short peduncled clusters, which are loosely panicleate or disposed on short branches in a very narrow panicle; calyx-lobes ovate, obtuse or with a very short point; petals rose-purple, 5 to 9 lines long; carpels smooth, promptly dehiscent.—(*M. thurberi* Gray. *Malva fasciculata* Nutt.)

Dry inner South Coast Range hills; Mt. Diablo; Pacheco Pass and southward to Southern California. June-July.

5. SIDA L.

Ours low yellowish scurfy-tomentose perennial herbs. Pedicels articulated. Involucre of 1 to 3 slender deciduous bractlets. Flowers cream-color. Carpels 1-seeded, indehiscent or splitting into 2 valves. Seeds pendulous. (Greek name used by Theophrastus for a species of Water-lily.)

1. *S. hederacea* (Dougl.) Torr. ALKALI MALLOW. Stems from deep-seated taproots, decumbent, more or less branching, ½ to 1 ft. long; leaves round-reniform or ovate, dentate or serrate, ¾ to 2 in. broad, on petioles ½ to 1 in. long; flowers pediceled, axillary, solitary or in small clusters; calyx-

lobes acuminate; petals $\frac{1}{2}$ in. long; carpels 6 to 10, triangular, attached by a straight edge to the slender axis.

Abundant in subsaline soils throughout the Sacramento, San Joaquin, and South Coast Range valleys. May-Sept. Often a pest in orchards on account of its deep-seated roots; called "White Weed" at Elmira. Common on the "goose-lands" of Glenn Co.

STERCULIACEAE. STERCULIA FAMILY.

Shrubs or trees with alternate leaves and perfect regular or nearly regular 5-merous flowers. Stamens united at base into a tube. Ovary superior, 5 (or 4)-celled. Fruit a capsule.

1. FREMONTIA Torr.

Leaves small, often lobed. Pubescence stellate. Flowers showy, short-pedicelled, solitary and axillary on the branchlets. Stipules caducous. Bractlets 3 to 5, small. Calyx yellow and corolla-like, deeply 5-cleft into round-ovate lobes or sepals; these imbricated in the bud, the three inner a little larger, all with a rounded and sharply defined short-hairy glandular area at base. Corolla none. Stamens 5; filaments united to the middle. Style one, elongated, the acute apex stigmatic. Capsule 4 or 5-celled, loculicidally dehiscent. (General John C. Fremont, the Pathfinder of the Rocky Mountains and Sierra Nevada, and first United States Senator from California, who discovered it.)

1. **F. californica** Torr. FLANNEL BUSH. Evergreen; loosely branching and bush-like, 6 to 10 ft. high, rarely a small tree as much as 18 ft. high; branches tough and flexible, with many short leaf- and flower-bearing branchlets or spurs; leaves green above, covered beneath with a dense gray or whitish felt, $\frac{1}{4}$ to 1 in. long, or on sterile shoots somewhat larger; petioles short; calyx flannel-like, $1\frac{1}{2}$ to 2 in. broad, persistent, the lobes commonly mucronate; capsule ovate, covered with a dense brown felt and with short bristly hairs, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, persistent.

Rare in our region: near Cow Mt., east of Ukiah, *Purdy*, to southern Lake Co. (Hell's Half-acre, *Platt*); Loma Prieta; Wrights. Abundant in the southern Sierra Nevada. Also called "Leatherwood" and "Slippery Elm."

HYPERICACEAE. ST. JOHN'S WORT FAMILY.

Ours herbs or slightly suffrutescent plants. Leaves opposite, entire, without stipules and with pellucid dots or dark glands. Flowers perfect, regular and hypogynous. Sepals 5 (in ours) or 4, herbaceous, persistent. Petals 5 (in ours) or 4, yellow (in ours). Stamens usually numerous, distinct or more or less united into 3 to 5 clusters. Ovary superior, 1 or 3-celled. Fruit a septicidal capsule. Seed without endosperm.

1. HYPERICUM L. ST. JOHN'S WORT.

Leaves sessile. Flowers cymose. Sepals 5. Petals 5, deciduous or marcescent. Styles in ours 3. Capsule conical to globose or oblong. (Ancient Greek name.)

Annuals; sepals longer than the petals; styles short; capsule 1-celled.

Erect from the base, more or less branching; stamens 6 to 12.....1. *H. mutilum*.
Procumbent, forming mats with ascending or erect branches; stamens 15 to 20.....

2. *H. anagalloides*.

Perennials; petals much longer than the sepals; styles long; capsule 3-celled; stamens very numerous.

Herbaceous; stems from rootstocks, simple or branched above.....3. *H. formosum*.
Suffrutescent; stems branching from the base.....4. *H. concinnum*.

1. *H. mutilum* L. Stem mostly simple below and branching above, 10 to 17 in. high; leaves ovate, 5 to 10 lines long, 3 to 6 lines broad, 5-nerved at base, sessile; flowers in leafy cymes at the ends of the branches; stamens 6 to 12; sepals linear to lanceolate, mostly shorter than the capsule; capsule ovate, $1\frac{1}{2}$ lines long.

Shores of the lower Sacramento and lower San Joaquin rivers. Aug.-Sept.

2. *H. anagalloides* C. & S. FALSE PIMPERNEL. Commonly forming dense mats 6 to 15 in. broad, with ascending or erect branches 2 to 5 in. high; leaves lanceolate to ovate or orbicular, obtuse, 5 to 7-nerved at base, 2 to 6 lines long and almost as broad; flowers in a leafy paniculate cyme, scarcely 2 lines long; sepals ovate or linear-oblong, unequal, longer than the capsules; stamens 15 to 20.

Common about springy places and along streamlets in the mountains: Santa Cruz Mts.; Lake Co. and northward; Sierra Nevada. July-Aug.

3. *H. formosum* H.B.K. var. *scouleri* Coulter. Stems from running rootstocks, slender, simple or branching at summit, 2 to 3 ft. high; leaves ovate or oblong, obtuse, conspicuously black-dotted along the margins, sessile by a more or less clasping base, 1 in. long or less; flowers in more or less panicle cymes; sepals and petals black-dotted similarly to the leaves; sepals 2 lines long or less; petals 6 lines long; stamens numerous, in 3 clusters.

Howell Mt. and northward in the Coast Ranges at the higher altitudes, but rare; more common in the Sierra Nevada.

4. *H. concinnum* Benth. GOLD-WIRE. Stems wiry, numerous from the woody crown, forming a bushy plant about 1 ft. high; leaves thickish, lanceolate or linear-oblong, acute, inserted by a narrow base, usually folded, black-dotted as in the preceding but more scantily, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; flowers 1 in. or more broad, in rather close clusters at summit of the stem; sepals ovate, mucronate-acuminate, longer than the capsule; stamens numerous, 4 of the filaments in each of the 3 clusters distinctly united at base, the others free; styles divaricately spreading.

Dry brushy mountain slopes and ridges: North Coast Ranges; Sierra Nevada. June-Sept. "Poisons sheep (and even horses and cattle, particularly of a white color)."—Wallace Dinsmore, Marysville.

ELATINACEAE. WATER-WORT FAMILY.

Small annuals with opposite leaves and membranous stipules between them. Flowers 2 to 5-merous, small, perfect, symmetrical, solitary in the axils. Sepals, petals and stamens all distinct and hypogynous. Ovary with as many cells as there are sepals; styles distinct. Capsule 2 to 5-celled, septicidal or the partitions more or less persisting with the axis; placentae central.

Flowers 2 to 4-merous; sepals obtuse, without midrib.....1. ELATINE.
Flowers 5-merous; sepals pointed or acute, with thickened midrib and scarious margins....

2. BERGIA.

1. ELATINE L. WATER-WORT.

Glabrous dwarfs, somewhat succulent, growing in water or in wet places, rooting at the nodes. Leaves entire. Flowers 2 to 4-merous. Sepals submembranous, obtuse. Petals white or whitish. Capsule globose, thin-membranous, 2 to 4-celled, several- or many-seeded. Seeds striately sculptured. (Greek, etymology obscure.)

Flowers sessile, mostly 2-merous.....1. *E. brachysperma*.
 Flowers short-pedicelled, mostly 4-merous.....2. *E. californica*.

1. ***E. brachysperma*** Gray. MUD PURSLANE. Mostly terrestrial, the plants forming little mats (2 or 3 in. across) in wet places or late vernal beds of winter pools; leaves obovate or oblong, narrowed at base, 1 to 2 lines long; flowers sessile, mostly 2-merous; capsule bursting irregularly; seed with 6 to 7 longitudinal lines and 10 to 12 cross-bars.

Walnut Creek and southwestward to the coast. May.

2. ***E. californica*** Gray. Leaves obovate or oblanceolate, the lower ones petioled; flowers on short pedicels; sepals and petals 3 or 4, the stamens twice as many; seeds curved, with 10 or 12 longitudinal lines and several cross-lines.

Lower Sacramento Valley; northern Sierra Nevada.

2. **BERGIA** L.

Branching annual, very leafy, with pubescent herbage. Flowers pediceled and often fascicled, 5-merous. Sepals pointed or acute, with strong midrib and searious margins. Capsule ovoid, of firm texture, more or less of the partitions remaining with the axis. (Dr. P. J. Bergius, Swedish naturalist of the 18th century.)

1. ***B. texana*** (Hook.) Seubert. Diffusely branched, 6 to 12 in. high; stems glandular-pubescent; leaves obovate or oblanceolate, tapering at base, serrulate at apex, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; sepals 2 lines long, equaling or exceeding the whitish petals; stamens 5 or 10.

Sacramento and San Joaquin valleys.

FRANKENIACEAE. FRANKENIA FAMILY.

Ours low perennial herbs or somewhat suffrutescent plants, with opposite entire leaves and no stipules, perfect flowers, a 1-celled superior ovary with 2 to 4 parietal placentae, and seeds with a straight embryo.

1. **FRANKENIA** L.

Leaves small, crowded and fascicled in the axils. Flowers sessile, solitary, or by the reduction of the upper leaves to bracts becoming somewhat cymose. Calyx tubular, furrowed or almost prismatic, 4 or 5-toothed. Petals 4 or 5, appendaged at the very base of the blade, the appendage decurrent on the claw. Stamens in ours about 6 (4 to 7), hypogynous, exserted from the tube. Style in ours 3-cleft, included. Capsule linear, angled, included in the persistent calyx, 2 to 4-valved, the seeds attached by filiform funiculi to the margins of the valves. (John Franke, Swedish Professor at Upsala, the first author who treated of Swedish plants.)

1. ***F. grandifolia*** C. & S. ALKALI-HEATH. Erect or diffuse, slightly woody at base, 8 to 13 in. high, glabrous or somewhat pubescent or short-hirsute, particularly at the nodes; leaves obovate to linear-oblanceolate, 3 to 6 lines long, with revolute margins, sessile or short-petiolate, the opposite pair mostly united by a somewhat membranaceous sheathing base; calyx 3 lines long, narrow-cylindrical, with acute teeth; petals slightly irregular, pinkish, exserted 1 to $1\frac{1}{2}$ lines, with oblong blade erose at summit; filaments sometimes slightly dilated below the middle; seeds numerous.

Common along the sea-shore, in salt-marshes, and on alkaline plains of the interior. June-Oct. Called Yerba Reuma by Spanish-Californians.

CISTACEAE. ROCK-ROSE FAMILY.

Low shrubs but ours herb-like or barely suffrutescent. Flowers complete, regular, hypogynous. Sepals 5, persistent (2 smaller, wholly on the outside and bract-like). Petals 5, ephemeral. Stamens indefinite. Ovary superior, 1-celled with 3 parietal placentae; style one; ovules orthotropous on slender funiculi. Capsule 3-valved.

1. *HELIANTHEMUM* Pers.

Leaves alternate, simple, entire. Petals yellow, opening but once. Stamens usually numerous, with filiform filaments and short anthers. Style very short or none; stigma capitate, 3-lobed. Capsule 1-celled or nearly 3-celled by the intrusion of the placentae. (Greek helios, sun, and anthemon, blossom.)

1. *H. scoparium* Nutt. Mostly suffrutescent at base, erect, 1 to 2 ft. high, corymbosely much branched, glabrous or nearly so; leaves small, narrowly linear, sometimes very few; sepals minutely pubescent, sometimes glandular, the inner 2 to 3 lines long, the two outer minute; corolla 5 to 7 lines broad; placentae partition-like; embryo slender and much coiled.

Dry slopes and ridges of the Coast Ranges from Lake Co. to Mt. Tamalpais and southward; not common. Apr.-May. Branches commonly clustered and very rush-like, owing to the sparseness, or to the early deciduous character of the foliage.

RESEDACEAE. RESEDA ODORATA L. (Mignonette). Branching annual herb with simple alternate leaves and complete irregular inconspicuous flowers in racemes; sepals and petals 4 to 7, the latter deeply cleft; stamens indefinite, on one side the flower; ovary 1-celled, opening at the top before the seeds ripen.—An escape in Marin Co. Very fragrant.

VIOLACEAE. VIOLET FAMILY.

Perennial herbs with alternate stipulate leaves and complete flowers. Sepals 5, persistent. Corolla irregular, consisting of 5 somewhat unequal petals, 2 upper, 2 lateral and 1 lower, the lower spurred at base. Stamens 5, with short and broad filaments bearing the anthers on their inner face and connivent over the ovary. Ovary superior, 1-celled, maturing into a 3-valved capsule with valves placenta-bearing along the middle. Style and stigma one. Seeds rather large, with a hard coat and straight embryo in fleshy endosperm.

1. *VIOLA* L. VIOLET.

Peduncles axillary, 1-flowered. Stipules persistent. Sepals unequal, produced below the point of insertion into auricles, persistent. Stamens with broad connectives which are prolonged beyond the anthers, the two lower bearing spurs which project into the spur of the corolla. The valves of the capsule bear the seeds along the middle, and after dehiscence fold together firmly lengthwise and eject the seeds with violence. (Old Latin name used by Virgil.)

A. *Leaves all undivided.*

Flowers violet or purple; leaves broadly ovate, truncate or subcordate at base, obtuse at apex 1. *V. canina*.
Flowers white, or white and yellow and purple; leaves cordate or triangular-ovate, more or less acute or pointed at apex 2. *V. ocellata*.
Flowers yellow.

Stems erect, short; leaves often oblong; high montane 3. *V. purpurea*.

Stems erect, longer; leaves round-ovate with truncate base; low open hills 4. *V. pedunculata*.

Stems prostrate, stolon-like; leaves round-cordate, rounded at apex, glandular-dotted;

Redwood belt5. *V. sarmentosa*.
 Stems erect, long; leaves reniform-cordate, very broad and long-petioled; wet woods....
 6. *V. glabella*.

B. Leaves divided; flowers yellow.

Acaulescent; leaves bipinnatifid into narrow segments.....7. *V. douglasii*.
 Caulscent; leaves cleft or divided into few to several lobes.....8. *V. lobata*.

1. *V. canina* L. var. *adunca* Gray. DOG VIOLET. Stems leafy, 2 to 4 in. high, leaves round-ovate to elliptic-ovate, the lower inclining to be subcordate, obscurely crenate, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; stipules more or less herbaceous and lacerate; petals violet, turning to red-purple, 6 lines long or less, the lateral strongly bearded inside at base, the upper pair with a slight tuft in the middle at base; spur much shorter or quite as long as the petals.

Hilltops in the vicinity of the coast: San Francisco; Pt. Reyes Peninsula. Feb.-Apr.

2. *V. ocellata* T. & G. WESTERN HEARTSEASE. Stems erect, 5 to 12 in. high, from creeping rootstocks; leaves cordate- to triangular-ovate, crenate, acute or abruptly acuminate or somewhat pointed at apex, 1 to $2\frac{1}{2}$ in. long, the radical long-, the cauline short-petioled; stipules small and scarious; peduncles mostly shorter than the leaves; petals 5 to 7 lines long; two upper petals white, violet-purple on the outside; the other petals white or yellow, the lateral with a deep purple spot at base, the lower one purple-veined at base.

Shady woods, Monterey and the Santa Cruz Mts. to Mendocino Co.; not in the inner Coast Ranges. Mar.-June.

3. *V. purpurea* Kell. MOUNTAIN VIOLET. Plants 3 to 6 in. high; stems very short and densely tufted, from a stout vertical root; young herbage hirsutulous-canescens; leaves rhombic-ovate or oblong (1 or 2 frequently nearly round), dentate or crenate or sometimes nearly entire, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, on petioles 1 to 3 in. long; peduncles surpassing the leaves, 2 to 4 in. long; petals yellow, brownish on the outside.

Coast Range peaks and high mountain ridges: Loma Prieta; Mt. Diablo; Napa and Mt. Hood ranges and northward. Also Sierra Nevada. Mar.-Apr.

4. *V. pedunculata* T. & G. YELLOW PANSY. Short-caulescent, the stem 2 to 6 in. high and ascending, from a thick deep-seated rootstock; leaves round-ovate, usually with truncate base, coarsely crenate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; petioles 1 to 2 in. long; stipules foliaceous, narrowly lanceolate, uppermost often sparingly incised; flowers large, 1 in. broad, on erect peduncles (4 to 5 in. long) much surpassing the leaves; petals golden yellow, the upper dark brown on the outside, the others purple-veined within; lateral petals bearded; stigma bearded; capsule broadly oblong, 5 lines long.

Open hills: Vacaville to Berkeley; Lake Merced; and southward in the Coast Ranges to Southern California. Mar.-Apr.

5. *V. sarmentosa* Dougl. WOOD VIOLET. Stems prostrate, stolon-like, sparsely leafy; peduncles commonly longer than the leaves, at first scape-like and arising from the cluster crowning the stipular-sealy rootstock; stipules brown-scarious, ovate-subulate; leaves round-cordate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. broad, rather shorter than the peduncles, deep green above, often rusty beneath, finely crenate, in age brown-punctate; petioles of the cauline leaves $\frac{1}{2}$ to 2 in. long or less, of the radical 1 to 7 in. long; petals uniform light yellow, the lower a little purple-veined, 4 lines long; spur very short and broad.

Woods of the Coast Ranges, especially in the Redwood belt; multiplying vegetatively by filiform rootstocks.

6. **V. glabella** Nutt. Stems erect, mostly weak, naked below or nearly so, 7 to 12 in. high; rootstock horizontal, often branching; herbage glabrous or puberulent, bright green; radical leaves reniform-cordate, $1\frac{1}{2}$ to $3\frac{3}{4}$ in. broad, on elongated (4 to 11 in.) petioles, the cauline similar or cordate, on petioles 4 to 5 lines long; stipules small and thin-membranous; peduncles about $1\frac{1}{2}$ in. long; petals bright yellow, more or less purple-veined, 6 lines long, the lateral ones bearded; spur short and saccate; stigma beardless; capsule oblong, 4 lines long, abruptly beaked.

Wet places in Coast Range woods: Monterey and northward. Also Sierra Nevada. Mar.-May.

7. **V. douglasii** Steud. Acaulescent, the cluster of stems subterranean and from a rather deep and short caudex-like rootstock; leaves bipinnatifid with long linear or oblong segments; stipules lanceolate, entire or incised; flowers usually large, on peduncles (2 to 5 in. long) equaling or exceeding the leaves; petals about 6 lines long, orange-yellow, the two upper brownish purple externally, the others purple-veined; lateral ones beardless; capsule 3 or 4 lines long, acute.—(*V. chrysantha* Hook.)

Open hillsides in the Coast Ranges and Sierra Nevada. Readily recognized by its much dissected leaves.

8. **V. lobata** Benth. PINE VIOLET. Erect, 4 to 14 in. high, the stems naked below; rootstock short, bearing many fleshy-fibrous white roots; leaves 1 to 2 in. long, ovate or almost round in outline, cordate or truncate at base, palmately 3 to 5-cleft or divided, the lobes entire or somewhat repandly toothed, and the lateral usually larger; inflorescence somewhat umbellate; peduncles 1 to 2 in. long; petals yellow, purple on the outside; valves of the capsule deeply concave-carinate.

Coast Ranges north of San Francisco Bay, often under Yellow Pine. Mar.-Apr. Var. **INTEGRIFOLIA** Wats. Leaves of similar outline, crenate or with a few very coarse teeth, but not at all lobed.—Howell Mt.

LOASACEAE. LOASA FAMILY.

Herbs with either rough or stinging hairs, and often with white deciduous bark. Leaves in ours alternate. Flowers regular, complete. Calyx-tube adnate to the 1-celled ovary, its limb 5-lobed. Petals 5. Stamens usually very numerous, inserted with the petals on the throat of the calyx. Placentae 2 or 3, parietal. Fruit a capsule, crowned with the calyx-lobes.

1. MENTZELIA L.

Erect annuals. Leaves in age brittle, adhering very tightly to clothing by means of barbed hairs. Flowers terminal, solitary or cymose, small or showy. Styles 3 or 1. Capsule dehiscent at the summit, few to many-seeded. Seeds flat; endosperm scanty. (C. Mentzel, a German botanist of the 17th century.)

Annuals; capsule linear or clavate; seeds cylindric or angular, wingless.

Petals mostly 2 lines long or less.

Floral leaves broad, almost concealing the flowers; seeds much longer than broad....

1. *M. micrantha*.

Floral leaves very much shorter than the flowers; seeds cubical....2. *M. dispersa*.

Petals mostly 4 lines long or more.

Capsule linear, hispid; petals pale yellow, 3 or 4 lines long.....3. *M. affinis*.

Capsule linear-clavate to obconic.

Petals about $\frac{1}{2}$ in. long.....4. *M. gracilentia*.

Petals 1 to $1\frac{1}{4}$ in. long, golden-yellow.....5. *M. lindleyi*.

Biennial; capsule oblong; seeds flat, winged.....6. *M. laevicaulis*.

1. *M. micrantha* T. & G. Rough-hispid, at least above; stems simple below, corymbosely and rather compactly dichotomous above; leaves ovate, acute or acuminate, serrate or sinuate-toothed, 1 to 2 in. long or the uppermost roundish, entire, and 4 to 6 lines long; flowers very small, shorter than or scarcely exceeding the broad floral leaves; petals oval or obovate, $1\frac{1}{2}$ to 2 lines long, twice longer than the calyx-lobes; 5 of the filaments (opposite the sepals) petal-like with emarginate apex; capsule linear, sharply triangular, 3 lines long; seeds prismatic with grooved angles, 1 line long, twice as long as broad.

Coast Range hills from the Santa Cruz Mts. to Mt. Diablo. Clear Lake acc. to Bot. Cal.

2. *M. dispersa* Wats. Stems usually branching, 9 to 13 in. high, ostensibly smooth, pubescent under a lens; leaves oblong or ovatis, $1\frac{1}{2}$ in. long or less, entire or sometimes toothed; flowers small, approximate near the ends of the branches; calyx-lobes 1 line long, little shorter than the petals; petals obovate, 2 to 4 lines long; filaments not dilated; capsule linear, 6 or 7 lines long; seeds cubical, minutely mottled, rather acutely angled, as broad as long.

Montane species: Lower Lake grade to Kelseyville; Mt. Diablo. Also credited to the Sierra Nevada.

3. *M. affinis* Greene. Stoutish, simple and leafy below, widely branching above, 1 to 3 ft. high; leaves lanceolate in outline, deeply and often sharply pinnatifid; flowers 5 or 6 lines broad, numerous but not congested; calyx-lobes subulate, 2 lines long; capsule linear, subterete, $\frac{3}{4}$ to nearly 1 in. long, hispid with short stiff white hairs; seeds prismatic with grooved angles.

San Joaquin Valley plains.

4. *M. gracilentia* T. & G. Stem green, sparingly branched, or often simple, $\frac{1}{3}$ to $1\frac{1}{2}$ ft. high; leaves narrowly oblong in outline, pinnatifid into broadly linear lobes or only coarsely sinuate-toothed; upper leaves sometimes disposed to be ovate or lanceolate, somewhat sharply cleft or entire; flowers clustered at the summit; calyx-lobes 2 to 5 lines long; petals obovate or oblanceolate, rounded or retuse at apex, 4 to 6 lines long, yellow; filaments dilated and somewhat united at base; capsule clavate to obconic, 6 to 9 lines long; seeds in 3 rows, prismatic, minutely tuberculate, $\frac{2}{3}$ line long.

Los Angeles northward to Monterey Co. (San Antonio River, Brewer).

5. *M. lindleyi* T. & G. Slender, simple or branching, $1\frac{1}{2}$ to 4 ft. high; leaves ovate to narrowly lanceolate, pectinately pinnatifid or coarsely toothed, 2 to 3 in. long; flowers axillary and terminal; calyx-lobes 5 to 9 lines long, broadly lanceolate, acuminate; petals obovate, abruptly acuminate, golden yellow with vermilion base, 1 to $1\frac{1}{4}$ in. long; stamens numerous, about three-fourths as long as the petals; filaments very slender, about 15 of the outer ones with somewhat dilated bases; style one, entire; capsule linear-clavate, 1 to $1\frac{1}{4}$ in. long; seeds irregularly angular, minutely tuberculate.

Benicia; South Coast Ranges from Niles to Mt. Day, Corral Hollow and southward to the region of Mt. Hamilton. May-June. Flowers opening in the evening and remaining open during the morning of the next day. Called Buena Mujer or "Good Woman" by the Spanish-Californians because the leaves stick so tightly to one.

6. *M. laevicaulis* (Dougl.) T. & G. BLAZING STAR. Stout branching biennial, 2 to $3\frac{1}{2}$ ft. high, with shining white nearly smooth stems; leaves narrowly oblong or lanceolate, sinuately toothed, 3 to 7 in. long; flowers in clus-

ters of 2 or 3 at the ends of the branches, 3 or 4 in. broad, light yellow; calyx-segments lanceolate, 1 to $1\frac{1}{4}$ in. long; petals 5, broadly oblanceolate, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long, the numerous stamens almost as long; 5 stamens with petaloid filaments; capsule oblong, $1\frac{1}{4}$ in. long, 3 to 4 lines in diameter; seeds flat, winged.

Dry gravelly stream beds throughout the Coast Ranges and Sierra Nevada foothills. July-Sept. Flowers open all day.

DATISCEAE. DATISCA FAMILY.

Perennial herbs with alternate and in ours divided leaves. Flowers dioecious or in ours the pistillate commonly with a few stamens. Calyx synsepalous. Corolla none. Stamens indefinite. Ovary inferior, 1-celled, with 3 parietal placentae; styles 3, bifid. Fruit a capsule, opening at the top between the styles.

1. DATISCA L.

Stout glabrous herb. Leaves divided and more or less incised and sharply serrate. Flowers in clusters in the axils of the leafy branches. Calyx of staminate flower very short, with 4 to 9 unequal lobes; stamens in ours 8 to 12, mostly 10; filaments short. Calyx of pistillate flowers with ovoid tube, somewhat 3-angled, 3-toothed; stamens (when present) 2 to 4, alternate with the teeth. Seeds numerous, small, in 2 to several rows on the placentae. (Derivation unknown.)

1. *D. glomerata* (Presl.) Brew. & Wats. DURANGO ROOT. Stems commonly clustered, stoutish and somewhat fistulose, erect, branching above, $2\frac{1}{2}$ to 4 ft. high; lower leaves 5 or 6 in. long, nearly as broad, ternately divided, incised and serrate, the middle division largest and 3-lobed, the lateral unequally 2-lobed or incised; upper leaves shorter, with 3 lanceolate lobes, the lateral very small; staminate flowers in clusters of 3, on pedicels about 2 lines long, their calyces less than 1 line long; anthers $2\frac{1}{2}$ lines long, nearly sessile; pistillate flowers sessile or subsessile, 4 to 7 in a cluster, or somewhat scattered along short axillary branchlets, their calyces 4 or 5 times as long as those of the staminate flowers; styles longer than the ovary.

Dry stream beds of the Coast Ranges and Sierra Nevada to Southern California: Klamath River; Round Valley; Vaca Mts., *W. L. J.* no. 562; Ione; Tehipite Valley; Middle Tule River. May.

CUCURBITACEAE. GOURD FAMILY.

Herbs, mostly tendril-bearing and succulent, with simple palmately lobed leaves. Flowers unisexual, the petals united and blended with the calyx. Calyx-tube in the pistillate flower adherent to the 1 to 6-celled ovary; stigmas 2 or 3; placentae parietal or projecting from the axis. Staminate flower with 3 stamens, 2 of these with 2-celled anthers, the third one with a 1-celled anther. Fruit gourd-like, or dry and dehiscent. Seeds large, anatropous, without endosperm.—An order of characteristic aspect, well known on account of the Muskmelon (*Cucumis melo* L.), Cucumber (*C. sativus* L.), Pumpkin (*Cucurbita pepo* L.), Squash (*C. maxima* Duch.), Watermelon (*Citrullus vulgaris* Schrad.) and other esculent fruits of cultivation.

1. ECHINOCYSTIS T. & G. BIG ROOT.

Trailing or climbing herbs with branched tendrils and ivy-like but thin leaves. Flowers small, greenish or white, monoecious, the staminate in axillary racemes

or panicles, the pistillate pedicellate and solitary in the same axils. Calyx-teeth very small or obsolete. Corolla rotate or campanulate with 5 to 7 lobes or lanceolate segments. Staminate flowers with the short filaments united and the anthers distinct or coherent. Pistillate flowers with capillary staminodia or none; ovary globose or oblong, 2 to 4-celled, with 1 to 4 ovules in each cell; style very short; stigmas 2 or 3-parted or -lobed. Fruit prickly, somewhat fleshy or pulpy, at length dry and bursting irregularly on the sides or near the apex. Seeds ovoid or broadly oblong, more or less compressed, surrounded by a marginal line. (Greek echinos, a hedgehog, and kustis, a bladder, in reference to the spiny fruit. Our species are all perennial from exceedingly large, often deep-seated, fusiform or globose roots, sometimes as large as and not unlike the shape of a man's body, whence the common name, "Old Man in the Ground.") The germination of the seed is peculiar; see Gray, Structural Botany, p. 21.)

Corolla rotate, dull or greenish white; pistillate flowers without abortive stamens.....

Corolla campanulate, clear white.

1. *E. fabacea*.

Pistillate flowers with abortive stamens, the pedicels 3 to 6 lines long....2. *E. marah*.

Pistillate flowers without abortive stamens, the pedicels 1 to 2 in. long....3. *E. watsonii*.

1. *E. fabacea* Naud. COMMON MAN ROOT. Stems 12 to 30 ft. long; nearly glabrous or rough-scabrous; leaves more or less round-cordate in outline, 2 to 4 in. in diameter, with a deep and open sinus at base, mostly rather deeply 5 to 7-lobed, often with acutish segments; staminate flowers many in slender simple or compound racemes $3\frac{1}{2}$ to 5 in. long, the pedicels 1 to 3 lines long; corolla 3 to 4 lines in diameter, of a dull or greenish white; pistillate flowers 5 to 6 lines broad, destitute of abortive stamens, the pedicels 5 to 9 lines long; ovary globose, 2-celled, ovules 1 or 2 in each cell; fruit globose, 2 in. in diameter, very densely covered with stout spines 4 to 12 lines long; seeds commonly 4, sometimes less, oblong-ovoid, 9 to 13 lines long, 6 lines in diameter, surrounded by a shallow groove or darker lines.—(Megarrhiza californica Torr.)

The most common species, growing upon open hills or climbing in thickets; in some localities still very abundant on rich sandy ridges (high places) of interior grain fields: Coast Ranges; Sacramento and San Joaquin valleys. The var. AGRESTIS Greene, of eastern Contra Costa Co., is described as having smaller fruits with few short spines. *E. MACROCARPA* Greene (the Chilicothe) has a very spiny oblong pod 4 in. long.—Kaweah River basin to Southern California.

2. *E. marah* Cogn. HILL MAN ROOT. Stems 4 to 25 ft. long, mostly smooth; leaves muriculate-scabrous, especially on the upper surface, or almost glabrous, reniform or round-cordate, 3 to 7 in. broad, 2 to 4 in. long, 5 to 7-lobed with round sinuses; staminate inflorescence 6 to 10 in. long, the corolla 6 to 7 lines broad, clear white; pistillate flowers with abortive stamens (staminodia), the pedicels 3 to 6 lines long, or in fruit to $1\frac{3}{4}$ in. long; ovary ovate, 2 or 3-celled; ovules 1 to 4 or more in each cell, attached to the outer side of the cell; fruit ovate-oblong, $2\frac{3}{4}$ to $3\frac{1}{2}$ in. long, somewhat attenuate at each end, particularly at apex, nearly smooth or muricate with short weak spines; seeds horizontally placed, nearly round, flattened, about 1 in. long, rather less than $\frac{1}{2}$ in. thick.—(Megarrhiza marah Wats.)

Hills of Marin, Alameda and Contra Costa cos., often climbing over shrubs and trees.

3. *E. watsonii* Cogn. Stems slender, not succulent, 4 to 8 ft. long; herb-
age nearly glabrous, glaucous; leaves orbicular-cordate with nearly closed sinus
or broadly reniform, 2 to 4 in. broad, rather broader than long, deeply 5-lobed,
the lobes broader above and sinuately toothed or lobed; staminate panicle
slender, often few-flowered, the flowers small (about $1\frac{1}{2}$ to $2\frac{1}{2}$ lines in
diameter), white; pistillate flowers 3 to 5 lines broad, without abortive stamens,
on slender pedicels 1 to 2 in. long; ovary smooth or somewhat muricate; fruit
nearly globose, 1 to $1\frac{1}{4}$ in. in diameter, somewhat naked toward the summit
or covered all over with weak and very slender spines about $1\frac{1}{4}$ lines long,
2-celled, 2-seeded; seed not flattened, 7 to 9 lines long, 6 lines thick.

Vaca Mts., otherwise unknown in the Bay region. Sierra Nevada.

CUCURBITA L. Gourd. Stems prostrate, vine-like, scabrous; flowers large,
yellow, solitary; filaments distinct; fruit a smooth globose gourd. C. FOETI-
DISSIMA H.B.K. Calabazilla. Stems many feet long; leaves triangular-cor-
date or sub-cordate, 4 to 8 in. long; calyx-tube $\frac{1}{2}$ in. long; corolla 3 to 4 in.
long; gourd 3 to 4 in. in diameter.—Southern California to San Joaquin Co.
C. PALMATA Wats. Mock Orange. Leaves palmately 5-cleft; calyx-tube 1 in.
long; gourd 3 in. in diameter.—Southern California to San Joaquin Co.

LYTHRACEAE. LOOSE-STRIPE FAMILY.

Herbs with opposite or alternate entire simple leaves. Flowers perfect,
axillary or whorled. Calyx tubular, free from but enclosing the ovary, 4 to
6-toothed, sometimes with accessory teeth in the sinuses. Petals 4 to 6, in-
serted with the stamens on the calyx. Stamens in ours 4 to 8. Ovary and
capsule in ours 2 to 4-celled; style 1; stigma capitate (in ours).—*Punica*
granatum L. (Pomegranate) is in cultivation.

Flowers subsessile or pediceled, solitary in the axils; calyx cylindrical; leaves alternate...
Flowers sessile in the axils, 2 to 4 in a whorl; calyx in fruit globose; leaves opposite....

1. LYTHRUM.

2. AMMANNIA.

1. LYTHRUM L. LOOSE-STRIPE.

Slender herbs, with 4 or 5-angled stems. Leaves sessile, in ours alternate.
Flowers solitary in the axils, purple or whitish. Calyx cylindric or subcylin-
dric, 8 to 12-ribbed, its 4 to 6 teeth thin, erect, smaller than the greenish
accessory ones which are at first spreading and later erect. Petals 5 or 6,
the stamens in ours as many. Capsule oblong or cylindrical, 2-celled. (Greek
lythron, blood, applied either on account of the color of the flowers or the
styptic properties of certain species.)

Flowers distinctly pediceled; corolla 2 or 3 lines long; bright purple; perennial.....

1. *L. californicum*.

Flowers subsessile; corolla 1 line long or less, pale purple or almost white.

Perennial, stoloniferous.....2. *L. adsurgens*.

Annual, not stoloniferous.....3. *L. hyssopifolia*.

1. *L. californicum* T. & G. COMMON LOOSE-STRIPE. Stoloniferous peren-
nial; stems erect, paniculately branching above, 2 or 3 or even 6 ft. high;
leaves broadly or narrowly linear, the upper varying to lanceolate, the lower
to ovate-oblong, all more or less auricled, $\frac{3}{4}$ to 2 in. long; flowers distinctly
pediceled; calyx narrowly vase-shaped or in fruit clavate, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long,
its accessory teeth sharply acute; petals round-obovate, 2 to 3 lines long, bright
purple.

Common in low valley and marshy lands and about springs in the moun-
tains: Milpitas, Dr. R. J. Smith; Newark; Suisun. June-Sept.

2. *L. adsurgens* Greene. Stoloniferous perennial; branches 5-angled, decumbent or assurgent, 1 to 3 ft. long; herbage pallid, slightly succulent; calyx cylindric, $2\frac{1}{2}$ lines long, 12-ribbed, the ribs in maturity widening and thickened below; accessory teeth minute, subulate; petals pale purple or almost white, minute.

Low wet places at West Berkeley and in Santa Clara Co. (Muhl. iii, 76.) Perhaps a robust perennial variety of the next.

3. *L. hyssopifolia* L. Annual; stems slender and simple or with several branches from below the middle, 4 to 9 in. high; herbage pale, glabrous; leaves linear or oblong, 3 to 7 lines long; flowers subsessile in the axils; calyx cylindric, 2 lines long; petals 1 line long or less, pale purple or whitish.

Dry hillsides or hollows of the Coast Ranges, preferring slightly alkaline localities: Knights Valley grade and Howell Mt. southward to New Almaden. Aug.-Sept. Also on the north Atlantic Coast and in Europe.

2. AMMANNIA L.

Glabrous annuals with mostly 4-angled stems. Leaves opposite, sessile or narrowed to a short-petioled base. Flowers purplish, 2 or more in each axil. Calyx campanulate (in fruit globose or nearly so), the tube 8-ribbed, 4-toothed and usually with small accessory teeth in the sinuses. Petals 4, purplish, small and deciduous, or wanting. Stamens 4 to 8. Capsule globular. (Johann Ammann, a German botanist of the 18th century.)

Leaves sessile by a broad auricled base.....1. *A. coccinea*.
Leaves tapering at base, sometimes short-petioled.....2. *A. humilis*.

1. *A. coccinea* Rottb. Erect, simple or branching below, 4 to 14 in. high; leaves horizontally spreading, broadly linear or somewhat narrowed towards the apex, 1 to 2 in. long, sessile by a broad auricled base; flowers in whorls of 2 to 5; calyx in flower narrowly campanulate, strongly 8-ribbed, in fruit distended and the ribs less obvious; capsule 2 lines long.—(*A. latifolia* L.)

Low lands along interior rivers: Cache Creek; lower Sacramento River islands; San Joaquin River.

2. *A. humilis* Michx. Smaller; leaves linear-oblanccolate, tapering at base (not auricled) and sometimes short-petioled; flowers 1 to 3 in each axil; accessory teeth of the calyx sometimes as long as the proper teeth; capsule dehiscent septically.

Stockton.

ONAGRACEAE. EVENING PRIMROSE FAMILY.

Annual or perennial herbs with simple leaves sometimes lobed or divided. Flowers complete, symmetrical, the parts in 4s (rarely in 5s or 2s), borne in spikes or racemes, or solitary. Calyx-tube adnate to the ovary, the petals and stamens inserted at its summit. Stamens twice as many as the petals or as many. Pollen commonly cobwebby. Ovary wholly inferior, 4 (sometimes 5 or 2)-celled; style always single; stigma-lobes as many as the cells of the ovary, or stigma capitate. Fruit a capsule or rarely indehiscent. Seeds mostly small, naked or with a tuft of hairs at apex (coma); endosperm none.—An order of showy plants with a large representation in western America.

Parts of the flower in 4s or 5s; fruit a capsule (indehiscent in no. 1).

Tube of the calyx not produced beyond the ovary, the limb divided down to the ovary and persistent on it after flowering.

Petals 5, $\frac{1}{2}$ in. long or more; fruit at length reflexed.....1. *JUSSIEA*.

Petals none or minute; fruit erect.....2. *LUDWIGIA*.

- Tube of the calyx produced beyond the ovary, the limb with the free portion of the calyx-tube deciduous after flowering; parts of the flower always in 4s; ovary 4-celled.
- Seeds with a tuft of hairs at one end.
- Flowers large; corolla and calyx scarlet.....3. *ZAUSCHNERIA*.
- Flowers small; corolla white or purplish.....4. *EPILOBIUM*.
- Seeds naked.
- Flowers purple, rose-color or white, never yellow.
- Calyx-lobes erect or ascending; petals small or minute.....5. *BOISDUVALIA*.
- Calyx-lobes reflexed or the tips remaining united and turned to one side in anthesis.
- Petals distinctly clawed, often much lobed.
- Stamens 8; calyx-tube short, obconical.....6. *CLARKIA*.
- Stamens 4; calyx-tube elongated, filiform.....7. *EUCHARIDIUM*.
- Petals sessile, not lobed except in *G. biloba*; stamens 8.....8. *GODETIA*.
- Flowers yellow or (in two species) white.....9. *OENOTHERA*.
- Parts of the flower in 2s; fruit bur-like.....10. *CIRCAEA*.

1. *JUSSIAEA* L.

Glabrous perennial herbs, ours aquatic or of muddy shores. Leaves alternate. Flowers yellow, solitary in the axils, pediceled. Calyx-tube elongated, not produced beyond the ovary, its lobes 5. Petals 5. Stamens twice as many. Fruit (in ours) 5-celled. Seeds very numerous. (Bernard de Jussieu, who founded the natural system of classification.)

1. *J. californica* Jepson. YELLOW WATER-WEED. Stems 1 to 6 ft. long; leaves oblong to obovate, $\frac{7}{8}$ to 2 in. long, the floating ones elliptic or orbicular and with longer petioles; calyx-lobes lanceolate, $\frac{1}{2}$ in. long; petals broadly obovate, 6 to 7 lines long; fruit woody, cylindric, 10 lines long, indehiscent, at length reflexed and the calyx-segments deciduous from the mature fruit; fruiting pedicel $\frac{1}{2}$ to $\frac{3}{4}$ in. long; seeds large for the order, with a very thick tough outer coat; cotyledons elliptic, caulicle very short.—(*J. repens* var. *californica* Wats.)

Rivers, streams and lakes, Coast Ranges east to the Sierra Nevada foothills, especially common in the tide sloughs of the lower Sacramento and San Joaquin rivers.

2. *LUDWIGIA* L. FALSE LOOSE-STRIFE.

Aquatic or marsh perennial herbs, with the aspect of the preceding, but the leaves opposite, parts of the flower in 4s, and the petals often absent. Stamens as many as the petals and alternate with them. Ovary broad at apex and usually flattened, or crowned, with a conical style-base. Capsule 4-celled, dehiscent by lateral slits or terminal pores. Seeds minute. (C. G. Ludwig, 1709-1773, Professor of Botany at Leipsic.)

1. *L. palustris* Ell. WATER PURSLANE. Glabrous, stem 6 to 12 in. long; leaves obovate, acute or acuminate, narrowed at base into a rather long petiole, the whole leaf 8 to 12 lines long; petals none, or minute and reddish; capsule erect, broadly oblong, $1\frac{1}{2}$ lines long, more or less 4-sided or -angled, with a narrow longitudinal band of tubercles on each side.

Muddy shores: Healdsburg; Clear Lake. Aug. Fr. Sept. Capsule yellowish, the persistent sepals green.

3. *ZAUSCHNERIA* Presl.

Low perennials with alternate leaves (the lowest opposite) and large scarlet Fuchsia-like flowers. Calyx above the ovary colored like the corolla, its tube funnelliform with a globose base (nectar-bearing within), and appendaged within at the most constricted portion with several erect and deflexed scales.

Petals inserted on the throat of the calyx and rather shorter than its erect lobes, obcordate or 2-cleft. Stamens 8, exserted, colored like the corolla; anthers linear-oblong, attached by the middle. Style long and exserted; stigma 4-lobed. Capsule linear, obtusely 4-angled, 4-valved and imperfectly 4-celled. Seeds oblong, with a tuft of hairs at the apex. (M. Zausehner, a Bohemian botanist, one time Professor of Natural History in the University of Prag.)

1. *Z. californica* Presl. BALSAMEA. Stems decumbent or erect, about 1 ft. high, woody at base, the herbage more or less villous or woolly; leaves oblong to linear-lanceolate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; flowers $1\frac{1}{2}$ to 2 in. long; calyx-lobes 4 lines long.

Dry stream-beds of the Coast Ranges, particularly on benches, or on rocky ridges, slopes, or cliffs. Aug.-Oct. Used as a vulnerary in rural medicine by Spanish-Californians. Var. *LATIFOLIA* Hook. Often nearly glabrous; leaves broadly ovate to ovate-lanceolate, conspicuously feather-veined.—Mt. Diablo range and middle altitudes of the Sierra Nevada.

4. *EPILOBIUM* L. WILLOW HERB.

Erect herbs; annual, perennial by creeping rootstocks, or propagating in the autumn by offsets. Leaves opposite or alternate. Flowers purple, rose-color or white, borne in racemes. Petals 4, often emarginate or bifid. Stamens 8, the 4 alternate shorter. Stigma oblong or 4-lobed. Ovary long and narrow, 4-celled. Capsule 4-valved. Seeds numerous, the summit bearing a tuft of long hairs (coma). (Greek epi, upon, lobus, a pod, and ion, a violet.)

Flowers small; petals notched or obcordate, not opening beyond funnelform; capsule rather prominently ribbed or angled.

Perennials; coma mostly persistent.

Leaves mostly alternate; petals $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

Glabrous below; inflorescence white-pubescent.....1. *E. californicum*.

Pubescence chiefly glandular.....2. *E. adenocaulon*.

Silky pubescent throughout.....3. *E. holosericeum*.

Leaves mainly opposite; petals 3 to 5 lines long.

Tomentose; flowers exceeding the reduced upper leaves.....4. *E. watsonii*.

Glabrate below, glandular-pubescent above; flowers scarcely surpassing the terminal leaves.....5. *E. franciscanum*.

Annuals; stems with shreddy bark at base; coma very deciduous.

More or less pubescent, $\frac{1}{2}$ to 1 ft. high; petals emarginate.....6. *E. minutum*.

Glabrous or glandular, $1\frac{1}{2}$ to 5 ft. high; petals deeply 2-cleft.....7. *E. paniculatum*.

Flowers large; petals entire, opening nearly flat, 5 to 7 lines long; capsule terete; perennials.....8. *E. angustifolium*.

1. *E. californicum* Hausskn. Slender, 3 to 4 ft. high, glabrous below, the inflorescence and buds rather coarsely white-pubescent; leaves lanceolate or oblong-lanceolate, remotely serrulate, 3 to 4 in. long or less, short-petioled; flowers few; pedicels of mature fruit slender, occasionally equaling the floral leaves; capsule nearly glabrous.

Fort Ross, *Wrangell*; common in low ground on the lower Sacramento River.

2. *E. adenocaulon* Hausskn. var. *occidentale* Trelease. Three to 4 ft. high, remotely leafy, finely glandular-pubescent, especially on the strict branches; leaves triangular-lanceolate, 2 in. long or less, denticulate, short-petioled, passing into the small floral ones, these acute at both ends; flowers small; petals 1 to $1\frac{1}{2}$ lines long; capsule slender, short-pedicelled.

About springs in the mountains and moist places in the valleys: Napa Valley; Lake Co.; Suisun Marshes.

3. *E. holosericeum* Trelease. Simple below, loosely branched above, 3 to

4 ft. high; silky-pubescent or canescent; leaves oblong-lanceolate, low-serrulate, narrowed into short petioles, 2 to 4 in. long, those of the flowering branches small and scattered; flowers scattered along the elongated branches; petals 2 lines long, nearly white; pedicels of mature capsules 5 lines long.

Stream beds in the Vaca Mts.; San Bernardino Co. Aug.-Sept.

4. *E. watsonii* Barbey. Plants $1\frac{1}{2}$ ft. high, tomentose-pubescent throughout; leaves elliptical, denticulate, rounded to short-winged petioles; flowers rose-red, not so crowded as in the preceding, protruding beyond the more reduced and lanceolate upper leaves; seeds coarsely papillate, coma dingy.

Fort Ross, Sonoma Co.; not known otherwise within our limits.

5. *E. franciscanum* Barbey. One to 3 ft. high, glabrate below, glandular-pilose above; leaves elliptic- to ovate-lanceolate, serrate, on short petioles, the lower opposite, the uppermost often pilose along the midrib; racemes dense, the red-purple or pale flowers scarcely surpassing the somewhat reduced bracts; capsule 2 to 4 in. long; seeds hyaline, papillate, coma sometimes tawny.

Muddy margins of lakes and streamlets: San Francisco; Capitola (Muhl. iii. 76). No. 2 approaches this, but differs in its smaller and less corymbosely-clustered flowers.

6. *E. minutum* Lindl. Commonly with diffuse ascending branches, 5 to 12 in. high, pubescent below; leaves broadly or narrowly lanceolate, entire or denticulate, 6 to 9 lines long, veinless; flowers distributed along the stem, rose-color or white; petals emarginate, 1 line long; 4 longer stamens equaling the style; capsule 1 in. long, pediceled; seeds $\frac{1}{2}$ line long or less.

Dry hills of the Coast Ranges: Los Gatos (Muhl. iii, 116); Mt. Tamalpais; St. Helena and northward. May. Var. *FOLIOSUM* T. & G. Leaves linear-spatulate, with smaller ones fascicled in the axils.—Napa Valley; Geysers. Var. *BIOLETHI* Greene. Minutely canescent on the inflorescence; flowers much smaller than in the species.—Mill Valley.

7. *E. paniculatum* Nutt. Stem very shreddy, simple below, paniculately branched above, $1\frac{1}{2}$ to 5 ft. high or more; glabrous below, more or less glandular above; leaves lanceolate, mostly alternate, with smaller ones fascicled in the axils, sharply but minutely denticulate, mostly veined, $1\frac{1}{4}$ to 2 in. long; flowers few, terminating the almost filiform spreading and nearly leafless branches, the bracts almost subulate; petals deeply 2-cleft into linear-oblong lobes, rotate-spreading, rose-purple, 3 to 4 lines long; capsule pediceled, about 1 in. long, sharply 4-angled and acuminate beaked; seeds $\frac{1}{2}$ to 1 line long.

Dry ground, everywhere common. July-Oct.

8. *E. angustifolium* L. FIRE-WEED. Stems erect, mostly simple from a stout root, 2 to 5 ft. high, glabrate below, the inflorescence canescent; leaves alternate, lanceolate, nearly entire, 4 to 6 in. long, the lateral veins confluent in submarginal loops; flowers large, in long racemes with small slender bracts; calyx cleft almost to the ovary; corolla slightly irregular, lilac-purple; petals 5 to 7 lines long, entire; stamens purple, in a single row, with filaments dilated at base; style exceeding the stamens, hairy at base, at first recurved; capsule 2 to 3 in. long.—(*E. spicatum* L.)

Seaward Coast Range in Sonoma Co.; common in the far North Coast Ranges and Sierra Nevada, appearing in great abundance on forest-burned areas. July. Entire inflorescence often purple, especially in the bud.

E. OBCORDATUM Gray. Six to 9 in. high, with bright rose-colored obcordately 2-lobed petals and yellow stamens.—Alpine in the Sierra Nevada.

5. BOISDUVALIA Spach.

Erect annuals with alternate leaves. Flowers small or minute, in leafy spikes or axillary along the branches. Calyx-tube (above the ovary) short, obconic, the lobes erect. Petals 4, obovate, sessile, 2-lobed, purple to white. Stamens 8, those opposite the petals shorter; anthers basifixed. Capsule 4-celled, 4-valved, sessile. (Jean-Alphonse Boissduval, French naturalist and physician, author of *Flora Francaise*.)

Capsule terete, membranous.

Capsule septifragal, the septa wholly persistent on the placental axis, which is thus 4-winged1. *B. densiflora*.

Capsule loculicidal, the septa adherent to the valves in dehiscence.

Floral leaves ovate or oblong.....2. *B. glabella*.

Floral leaves linear.....3. *B. stricta*.

Capsule 4-sided, coriaceous; dehiscence unknown.....4. *B. cleistogamâ*.

1. *B. densiflora* (Lindl.) Wats. Erect, 1 to 2 ft. high, branched above; leaves lanceolate, 2 in. long, the floral ovate, acute, about 3 to 6 lines long; inflorescence spicate, commonly elongated; petals about 2 lines long, about twice as long as the lobes of the calyx, and exceeding the subtending leaves; capsule 2 lines long, dehiscent; seeds ovate or triangular-ovate.

Widely distributed in the Sacramento, San Joaquin and Coast Range valleys and among the hills, preferring low ground where water has stood in spring pools. Also in the Sierra Nevada. June-Sept. Var. *IMBRICATA* Greene. Bracts densely imbricated, concealing the capsules; spikes commonly very long and virgate.—Santa Cruz; Marin Co.; Vaca Valley. Var. *MONTANUS* Jepson. Short lateral spikelets numerous below the short terminal spike, each spikelet subtended by a narrowly lanceolate bract $1\frac{1}{2}$ to 2 in. long.—Howell Mt.

Var. *bipartita* Jepson, n. comb. Herbage pale and villous; petals white, very deeply parted into 2 unequal lobes, the smaller about $\frac{2}{3}$ the length of the other, the open corolla thus seemingly composed of 8 petals, 4 long and 4 short; capsule villous; seeds few and large.—Arroyo del Valle, *Greene*. (*B. bipartita* Greene.)

2. *B. glabella* Walp. var. *campestris* Jepson, n. comb. Commonly branched from the base, 5 to 9 in. high, with a short scattered pubescence or nearly glabrous, the foliage bright green; upper (flowering) portion of branches densely imbricated with ovate or oblong denticulate leaves 5 or 6 lines long, in fruiting stage concealing the capsules; lower leaves ovate-lanceolate, scattered and rather longer, often with flowers in their axils; petals 2 lines long, purple; stamens opposite the sepals $1\frac{1}{2}$ lines long, the alternate ones shorter (sometimes with nearly sessile anthers); capsule almost straight, pointed at apex, 3 lines long; seeds fusiform, about 60.—(*B. campestris* Jepson.)

Plains of the lower Sacramento and San Joaquin valleys; associated with *B. cleistogama*. May-June.

3. *B. stricta* (Gray) Greene. Simple or often diffusely branched from the base, 5 to 13 in. high, pilose-pubescent or somewhat canescent; leaves linear, $1\frac{1}{2}$ in. long or less; petals 1 line long, violet; capsule slender, attenuate, arcuate-recurved, 6 to 7 lines long, not promptly dehiscent.

Lower Sacramento Valley, Howell Mt. and Cloverdale (type loc. *Bolander*) southward to New Almaden and the Santa Lucia Mts. June. Frequently

flowering from the very base, the branches often with sparse foliage, or the foliage strict.

4. **B. cleistogama** Curran. Commonly with stout rigid whitish branches or rarely simple, 4 to 8 in. high, pilose-pubescent, somewhat glandular, glaucescent; leaves linear or lanceolate, 1 to $1\frac{1}{2}$ in. long, remotely denticulate; flowers axillary along the branches, the earliest fertilized in the bud and never expanding, the later light pink; petals 2 lines long, bifid; capsule 4-sided, sharply angled, sharply pointed, the septal lines on each side distinct, 5 lines long, hard coriaceous, very tardily dehiscent, if ever.

Elmira, Mrs. K. Brandegee; Antioch; between Oakdale and La Grange, Jepson. The shallow vernal pools of the Sacramento and San Joaquin valleys are quickly dried up in the first month of summer. After the water has disappeared these pool-beds support a peculiar flora, one species being the plant here described.

6. CLARKIA Pursh.

Annuals with brittle stems and alternate leaves. Flowers showy, in terminal racemes (nodding in the bud). Calyx-tube above the ovary short, obconical, its lobes reflexed in flower, or remaining united and turned to one side. Petals 4, purple or rose-color, with claws, the limb entire or lobed. Stamens 8, those opposite the petals often sterile and rudimentary. Ovary 4-celled; style elongated, the stigma with 4 broad lobes. Capsule linear, or attenuate above, straight or somewhat curved, coriaceous, with very smooth sides, somewhat 4-angled, 4-valved. Seeds numerous, angled or margined. The lower leaves in this and in the two succeeding genera often disappear very early. (Captain Clarke of the Lewis & Clarke party, first expedition across the Rocky Mts. to the Pacific, 1806.)

Claw short and broad, much shorter than limb of petal, often toothed...1. *C. rhomboidea*.
Claw about as long as limb of petal, not toothed.....2. *C. elegans*.

1. **C. rhomboidea** Dougl. Erect, 1 to 3 ft. high, more or less branching, finely puberulent; leaves oblong to ovate, the blades entire, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, on petioles $\frac{1}{2}$ in. long, more or less; calyx-tube above ovary $1\frac{1}{2}$ lines long; calyx-lobes narrowly linear, carinate; petals rose-purple, often purple-dotted toward the base, rhomboidal, 3 to 5 lines long, the limb with a short broad often toothed claw; filaments with whitish hairy scales at base, those alternating with the petals with longer scales; capsule sessile or very shortly pediceled, commonly somewhat curved, 1 in. long.

Sierra Nevada and Coast Ranges, from the foothills to middle altitudes. May-July.

2. **C. elegans** Dougl. Habit similar to the preceding; herbage often reddish; leaves narrowly ovate, sometimes repand-denticulate, short-petioled; calyx-lobes broadly linear, plane; petals about 8 lines long, the limb about equaling the narrow entire claw, often spreading laterally in pairs; each filament with a reddish densely hairy scale at base, most developed opposite the short stamens; anthers of long stamens bright crimson, 3 lines long; anthers of short stamens commonly white; capsule usually curved, sessile, 7 to 12 lines long, often hairy.

Sierra Nevada and Coast Ranges, foothills and middle altitudes. Common. May-July.

C. XANTIANA Gray, of the upper San Joaquin at Fort Tejon, is like C.

elegans in calyx character but may be known by its 2-lobed petals with a subulate lobe in the sinus.—(*C. parviflora* Eastw.)

HETEROGAURA CALIFORNICA Rothrock. Annual; petals purple, 2 lines long; 4 of the 8 stamens sterile; ovary 4-celled; fruit indehiscent, with one seed in each cell.—Sierra Nevada. Nearly allied to *Clarkia*.

7. EUCHARIDIUM F. & M.

Small annuals with showy flowers. Calyx-tube linear-elongated or almost filiform above the ovary. Petals 3-lobed. Stamens 4, not appendaged at base; those opposite the petals wanting. Otherwise like *Clarkia*. (Greek *eucharis*, pleasing.)

Petals 3-lobed, the lobes nearly equal.....1. *E. concinnum*.
Petals fan-shaped and obcordate, a linear or spatulate lobe proceeding from the deep sinus and exceeding in length the lateral lobes, which are several times larger.....
2. *E. breweri*.

1. *E. concinnum* F. & M. Simple below or diffusely much branched from the base, $\frac{1}{2}$ to 2 ft. high, nearly glabrous; leaves broadly to narrowly oblong; calyx-tube above ovary 8 lines long; calyx-lobes crimson, linear-lanceolate, 9 lines long, abruptly recurved from the middle; petals rose-purple, 7 to 12 lines long, cuneate-obovate, 3-lobed, the middle broadest but little larger than the lateral; filaments not at all or scarcely dilated at base or apex, the anthers recurved after dehiscence and sparsely short-ciliate; capsule sessile, nearly straight, $\frac{3}{4}$ to 1 in. long; seeds short subcylindric, pointed at one end, the other end oblique and margined with a dense row of short teeth.—(*Clarkia concinna* Greene.)

Wooded districts of the Coast Ranges at middle altitudes, rarely in the lowest foothills: Humboldt Co. to Santa Barbara, especially common in the Bay region. May-June. The three upper petals are commonly approximate and ascending, the lower one opposite these and declined, thus making a corolla which is physiologically irregular and as if bilabiate.

2. *E. breweri* Gray. Branches few and spreading, 5 to 9 in. high; calyx-tube above ovary 1 to $1\frac{1}{4}$ in. long; petals a most beautiful luminous pink, fan-shaped and obcordate, about 1 in. long, the rather deep sinus with a linear or spatulate lobe proceeding from it which surpasses the large lateral lobes; filaments clavate- or globose-dilated at apex; anthers linear, brick-red, 3 lines long, conspicuously ciliate; style much longer than the stamens; stigmas white; capsule stout, sessile, straight, $1\frac{1}{4}$ in. long; seeds as in the preceding.—(*Clarkia breweri* Greene.)

Loose-shale slopes, San Carlos Range north to Mt. Hamilton, Mt. Day and Loma Prieta; also near the Geysers, Sonoma Co. (= *C. saxana* Greene). Rare and somewhat local species. The filaments and style are colored like the petals. The flowers diffuse a most delicate fragrance, recalling the honeysuckle of old-time gardens.

8. GODETIA Spach.

Mostly erect annuals with narrow shortly petioled or sessile alternate leaves. Flowers showy, red, purple, cream-color or nearly white, opening during the day, disposed in leafy racemes or spikes, the inflorescence sometimes reduced to but few flowers or a single one. Calyx often colored, its lobes reflexed in anthesis, or united and turned to one side; calyx-tube obconic or funnelliform. Petals 4, commonly broad and entire, sometimes notched or 2-lobed. Stamens

8, those opposite the petals shorter; anthers basifixed. Capsule linear, rarely ovate, 4-sided or terete, mostly longitudinally ribbed, 4-celled, 4-valved. Seeds in 1 or 2 rows, more or less cubical or elongated, often obliquely pointed at one end, the opposite end more or less obliquely truncate; chalazas central and the edges margined. (C. H. Godet, 1797-1879, author of "Flora de Jura.")

A. Flowers loosely spicate; capsule mostly terete, sometimes ribbed.

Buds nodding; calyx-lobes remaining united and turned to one side under the open flower
1. *G. biloba*.

Buds usually erect.

Calyx-tube long ($2\frac{1}{2}$ to 5 lines), the lobes remaining united and turned to one side under the open flower; capsule not ribbed.

Flowers loosely spicate-paniculate; capsule shortly attenuate at apex...2. *G. amoena*.

Flowers spicate or on short slender branchlets of the single main stem; capsule thick, blunt at apex.....3. *G. blasdalei*.

Calyx-tube short (1 to $1\frac{1}{2}$ lines), the lobes usually distinct; capsule more or less ribbed.

Capsule long and slender, not strongly ribbed; spikes usually long and flowers scattered.....4. *G. quadrivulnera*.

Capsule short and thick, strongly ribbed, hairy; spikes short or at least not loose.....5. *G. goddardii*.

B. Flowers in dense clusters; capsule 4-sided, 8-ribbed.

Petals 5 to 11 lines long.

Ovary hairy; petals pale crimson with a dark blotch at apex.....6. *G. purpurea*.

Ovary glabrous; petals rose-red, without blotch.....7. *G. arnotii*.

Petals large, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long; north coast of California.....8. *G. grandiflora*.

1. *G. biloba* (Dur.) Wats. Freely branching, $1\frac{1}{2}$ to 2 ft. high, or on poor soil or in exposed situations frequently simple and less tall; leaves oblong-lanceolate or linear, $\frac{1}{2}$ to 2 in. long, entire or remotely denticulate, the lower on long slender petioles; buds nodding, narrowly ovate, commonly abruptly tipped with a slender point; calyx-lobes united and turned to one side in anthesis, purplish brown, the tips not free in the bud; petals broadly cuneate, emarginate or with a deep v-shaped notch at apex, 5 to 11 lines long; capsule 4-sided, weakly 8-ribbed, 5 to 7 (11) lines long, on pedicels $\frac{1}{2}$ to 1 line long; calyx-tube with a dense ring of short white hairs at the mouth.

Sierra Nevada foothills, 1500 to 2000 ft.; northern Contra Costa Co.

2. *G. amoena* (Lehm.) Lilja. SUMMER'S DARLING. Erect, simple or more commonly branching, 1 to 3 ft. high; leaves linear to lanceolate, narrowed at base to a petiole or sessile, $\frac{1}{2}$ to 2 in. long (or with smaller ones fasciated in the axils), the uppermost half-conduplicate and curved; buds erect, rarely drooping; calyx-lobes united and turned to one side in anthesis but usually distinct at base, less commonly wholly distinct, 6 to 11 lines long, their tips not free in the bud; petals lilac-crimson or red-pink, often with a darker central splotch and base, abruptly narrowed to a short claw, 7 to 11 lines long; stigmas yellow, linear, $1\frac{1}{2}$ to 3 lines long; ovary canescent, sessile or very shortly pediceled; capsule teretish, not ribbed, tapering very slightly to each end, 1 to $1\frac{3}{8}$ in. long.

Near the coast from the Santa Cruz Mts. north to British Columbia. Very common and showy on shady banks or bushy hillslopes in San Mateo Co., Oakland Hills and Marin Co. July-Aug.

G. BOTTAE Spach. Tall; flowers pink or light crimson, showy, on pedicels $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; stigmas oblong or elliptic but united at base so as to form a swollen somewhat cup-shaped apex to the style.—Monterey Co. and southward to Southern California.

3. *G. blasdalei* Jepson. Stem erect, often stout, simple or with slender

short strict branches, 2 to 3 ft. high, soon leafless except above; leaves oblong to linear-lanceolate, acute, $1\frac{1}{8}$ to $1\frac{3}{4}$ in. long; herbage puberulent; flowers essentially like those of the large-flowered form of *G. amoena*, but petals notched at apex or even deeply bilobed; ovary thick below middle, tapering to base, and also to apex something like a rifle cartridge; capsule canescent, thick, terete, rather short (6 to 8 lines long), on pedicels $\frac{3}{4}$ to 2 in. long.

Pt. Isabel to Oakland, perhaps now extinct in Alameda Co. First collected by Douglas but the exact locality unknown.

G. PARVIFLORA Jepson. Diffusely branching from the base, the branches numerous and wiry; calyx in bud 4-sided and tips free, the lobes in anthesis commonly distinct; calyx-tube pinkish, long and slender ($2\frac{1}{2}$ to 5 lines long), usually longer than the ovary and commonly swollen slightly at the summit of ovary; petals cuneate-ovate, rose-red, 4 to $7\frac{1}{2}$ lines long; style nearly or quite equalling the petals; stigmas purple, elliptic, somewhat united at base; capsule teretish, rather strongly curved.—Monterey Co. June.

G. VIMINEA (Dougl.) Spach. Erect with showy flowers; calyx-lobes lanceolate, acuminate, primly reflexed; calyx-tube $2\frac{1}{2}$ to $5\frac{1}{2}$ lines long; petals purplish or crimson, with a large purple spot in center or at apex; stigmas purple, linear-oblong; capsule 4-sided, with 2 ribs on each side, or those of the lateral faces obscure or wanting.—Sierra Nevada foothills and north to Oregon.

4. *G. quadrivulnera* (Dougl.) Spach. Erect, simple or with simple branches from below the middle, $\frac{2}{3}$ to $1\frac{1}{2}$ ft. high; herbage pubescent or puberulent; lowest leaves obovate or oblong, 5 to 11 lines long, the upper narrowly or broadly linear, the uppermost lanceolate and somewhat conduplicate, $\frac{5}{8}$ to $1\frac{1}{8}$ in. long; flowers remote; calyx-lobes usually distinct and reflexed (in the earliest flowers sometimes united and turned to one side); petals lilac or pale crimson, usually with a spot at the top, $2\frac{1}{2}$ to 5 lines long; ovary canescent to densely villous; stigmas purple, short-oblong; capsule sessile, sharply 4-sided, the sides smooth or obscurely ribbed, often rather strongly beaked, $\frac{1}{2}$ to 1 in. long.

Open hillsides, Coast Ranges and Sierra Nevada foothills, the most common species. May-June.

5. *G. goddardii* Jepson. Simple or sparingly branched, 1 to $2\frac{1}{3}$ ft. high, foliage and buds as in preceding but spikes not so lax; petals pink-crimson or purple-crimson, with or without dark crimson spot at apex, $2\frac{1}{2}$ to 6 lines long; calyx-lobes primly reflexed, in pairs or quite distinct; capsule sessile, almost glabrous or canescently puberulent, terete, 8-ribbed, and with 8 distinct but small nerves which are median and at the sutural angles, 4 to 7 lines long.—(*G. albesens* var. *micropetala* Jepson, 1st ed. p. 334, in part.)

Dry hills of the Coast Ranges: Redwood Creek (Humboldt Co.); Napa Range; Fish Ranch (Contra Costa Co.).

6. *G. purpurea* (Curtis) Don. Typically simple and usually stoutish, $\frac{1}{2}$ to 2 ft. high, the flowers capitately congested at the summit or disposed in the upper axils of the leafy stem, the single flowers sometimes replaced by a cluster of 2 to 4 and borne on very short branchlets; herbage minutely pubescent; leaves ovatis-oblong or oblong, obtusish or merely acute, the upper oblong-lanceolate or lanceolate, entire or remotely denticulate, sessile or very shortly petioled, $\frac{1}{2}$ to $1\frac{1}{8}$ in. long; buds commonly pilose, their calyx-tips but slightly free; calyx-tube $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; petals broadly cuneate, trun-

catish and eroded at apex, 5 to 10 lines long, light crimson, usually with a wedge-shaped darker spot in middle at apex; stigmas oval, purple; ovary shaggy villous or canescent; capsule 4-sided, sessile, stoutish and mostly short, 5 to 7 (or 11) lines long, shaggy or merely pubescent, 8-ribbed; seeds faintly granulate on sides.

Dry open valleys: Sacramento and San Joaquin valleys south to Southern California; South Coast Ranges. May.

7. *G. arnottii* (T. & G.) Walp. Simple, 6 to 14 in. high, wholly glabrous; leaves thickish, rhomboidal-ovate to oblong or oblong-lanceolate, entire or sparingly denticulate, $\frac{5}{8}$ to $1\frac{1}{2}$ in. long, subsessile; buds glabrous, their calyx-tips free; flowers congested in a terminal head; calyx-tube $1\frac{1}{2}$ lines long; petals rose-red, with whitish base, orbicular, entire, 6 lines long; stigma whitish or pale crimson; ovary deeply grooved, quite glabrous; capsule teretish, 8-ribbed, 6 lines long.—(*G. lepida* var. *arnottii* Wats.)

Sandy-clay plains of the Sacramento Valley in Solano Co. The Douglas plant (type) has a minutely puberulent ovary; exact locality unknown. To be looked for between Monterey and San Luis Obispo.

G. SPARSIFOLIA Jepson. Simple or branching at the base, 11 in. high; flowers collected in a dense and leafy terminal cluster, the stem sparsely leafy below; leaves linear-oblong, acute, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, sessile; herbage pubescent or pilose, the deeply grooved ovary densely hairy; sepals distinct, calyx-tube narrow, $1\frac{1}{2}$ lines long; petals oblong-ovate, purplish with a spot towards summit, 5 lines long; stigma almost entire, purple; style as long as the long stamens, about half the length of the petals; capsule unknown.—San Joaquin Valley at Tracy, *Benj. Cobb*.

8. *G. grandiflora* Lindl. Dwarfish but stout, simple, or with short slender branches above the base, 8 to 12 in. high, very leafy; herbage minutely strigulose; leaves oblong, tapering strongly to apex and to the short petiole at base, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; buds very large, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. long, the calyx-tips not free; flowers in a short spike or dense cluster of short subterminal branchlets; petals cuneate-obovate, retuse at apex, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long, rose-red with a deeper flush or blotch in centre; stigmas yellow, linear, 3 lines long; capsule canescent, thick and short, $\frac{3}{4}$ in. long, strictly sessile; seeds in two rows in each cell.—(*Oenothera whitneyi* Gray.)

North Coast from Duncan Mills, *Harford*, to Shelter Cove, *Bolander*. Prized in cultivation, the garden flowers 4 or 5 in. across.

9. OENOTHERA L.

Herbs with alternate leaves. Flowers yellow or white, often turning greenish or reddish. Calyx-tube prolonged beyond the ovary, mostly deciduous, the lobes 4, reflexed. Petals 4. Stamens 8, equal, or those opposite the petals shorter, mostly versatile, sometimes basifixed. Capsule chartaceous to woody, often contorted or spirally coiled, 4-celled, 4-valved, dehiscent, in ours sessile. Seeds many, in 1 or 2 rows in each cell, naked. (Greek oinos, wine, and therea, pursuit, name given by Dioscorides to some now unknown plant, the roots of which were eaten to incite desire for wine.)

A. Calyx-tube linear or filiform, much prolonged beyond ovary.

Caulescent; calyx-tube linear.

Flowers yellow; tall biennial.....1. *O. grandiflora*.

Flowers white; low plants.

Biennial; calyx-tips not free in the bud.....2. *O. trichocalyx*.

Perennial; calyx-tips free in the bud.....3. *O. californica*.

Acaulescent; calyx-tube filiform; flowers yellow.

Perennial; leaves ovate or oblong, acute; petals 6 lines long or more.....4. *O. ovata*.

Annual; leaves linear; petals 3 to 4 lines long.....5. *O. graciliflora*.

B. Calyx-tube obconic, little prolonged beyond ovary.

Caulescent; flowers yellow.

Capsule sharply quadrangular, much contorted or spirally coiled; flowers turning greenish; radical leaves in a rosette or tuft.

Maritime species; procumbent or prostrate.

Petals 3 to 5 lines long.....6. *O. cheiranthifolia*.

Petals 1 to 2 lines long.....7. *O. micrantha*.

Interior species; erect or suberect; petals 1 line long.....8. *O. hirtella*.

Capsule not contorted or only slightly, linear, terete, $\frac{1}{2}$ line wide or less; radical leaves none.

Petals 1 to 2 lines long; anthers innate.....9. *O. strigulosa*.

Petals 2 to 3 lines long; anthers versatile.....10. *O. dentata*.

1. *O. grandiflora* Ait. EVENING PRIMROSE. Biennial, erect, usually simple, 2 to 4 ft. high; herbage canescently puberulent and often hirsute; leaves ovate to lanceolate, 4 to 8 in. long; calyx-tube 1 to $1\frac{1}{2}$ in. long, the tips free in the bud; petals yellow, 1 to $1\frac{1}{2}$ in. long and quite as broad; anthers versatile, $\frac{1}{2}$ in. long; style disk-shaped below the cylindric stigmas; capsule obtusely quadrangular, woody, $\frac{1}{2}$ to 2 in. long, the valves with a strong midrib; seed sharply angled, in 2 rows in each cell.

Sparingly naturalized: Alvarado; San Francisco; Purissima Creek; San Mateo Co.; Napa Valley; valley cañons of the Sierra Nevada (Yosemite, Hetch-Hetchy, etc.). May-Apr.

2. *O. trichocalyx* Nutt. Biennial; stems from a straight taproot, low, very stout, upright, simple or more commonly branched from the base, 1 ft. high, puberulent, or sparsely pilose and almost glabrous; leaves oblong, tapering to both ends, petioled, coarsely and rather remotely salient-toothed or lobed, 3 to 4 in. long, or the lowest longer; calyx-tips not free in the bud; bud (above calyx-tube) oblong, densely woolly, nearly 1 in. long or more; petals 1 in. long or more, usually with a deep sinus; capsule terete, strongly thickened towards the broad sessile base, $2\frac{3}{4}$ in. long or less, in maturity strongly deflexed, slightly curved, woody; seeds narrowly ovate, mottled, somewhat compressed, in 1 row in each cell.

Mt. Hamilton Range (Corral Hollow) to Bakersfield and southward to the Mojave Desert. June.

3. *O. californica* Wats. Similar to the preceding but stems more slender, ascending, from a perennial running rootstock; herbage hoary pubescent; calyx-tips free in the bud; bud (above calyx-tube) narrowly ovate, villous; capsule not thickened at base; seeds oblong, turgid.

Sacramento, Antioch sandhills and the San Joaquin Valley. Flowers vespertine, remaining open two or three hours in the morning or on a cloudy day until noon.

4. *O. ovata* Nutt. GOLDEN EGGS. Acaulescent; glabrous or the leaf margins and veins beneath ciliate; leaves oblong to ovate, acute, 3 to 6 in. long, mostly entire, the under ones narrowed at base to rather long petioles; calyx-tube very slender, 3 in. long, the segments glabrous; petals orbicular, $\frac{1}{2}$ in. long; capsules more or less below the surface of the ground, chartaceous, 1 in. long, tardily dehiscent; seeds in this and the next in 2 rows in each cell.

Common in the Coast Range valleys from Sherwood Valley, Ukiah and Calistoga to Marin Co., Berkeley, San Francisco, Millbrae and southward to San Luis Obispo. Feb.-Apr.

5. *O. graciliflora* H. & A. Acaulescent; pilose-pubescent; leaves erect or ascending, linear, obscurely denticulate or commonly entire, $3\frac{1}{2}$ in. long or less; calyx-tube beyond ovary filiform, about 1 in. long, the segments hirsute-pubescent; petals broadly obovate, the broad shallow notch at apex with a middle tooth or acumination, 3 to 4 lines long; capsule coriaceous.

Foothills on both sides of the Sacramento Valley and southward to Monterey. Apr. Petals often turning greenish or reddish.

6. *O. cheiranthifolia* Hornem. Stems decumbent or mostly prostrate, radiating from a central rosette crowning the taproot, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, rigid and tough; leaves thick, canescently pubescent, obovate to oblong or oblong-oblancoelate, obtuse, short-petioled or the uppermost sessile, $\frac{1}{2}$ to 1 in. long; calyx-tube 1 to 2 lines long; petals 3 to 5 lines long, broader than long and more or less truncate at apex; capsule acutely quadrangular or almost fluted, stout, chartaceous, linear-oblong, $\frac{3}{4}$ in. long, spirally once coiled, the attenuate apex mostly spreading; seeds in 1 row in each cell as in all the following.

Drifting sandhills: Oakland, San Francisco and southward along the coast. Flowering in summer, and more or less at all seasons.

7. *O. micrantha* Hornem. Branches procumbent from a short primary axis, not rigid or tough; pubescence hirsutulous; leaves oblong-lanceolate, $1\frac{1}{2}$ in. long, slightly undulate, more or less denticulate; petals entire or emarginate, 1 to 2 lines long; capsule sharply 4-angled, 1 in. long, contorted, often coiled into a single spiral, slightly attenuate upwards, sparsely hirsutulous, less chartaceous than in the last.

Along the coast from San Francisco southward. May-June.

8. *O. hirtella* Greene. Simple or with simple branches from the base, the branches suberect, flowering from the base or near it, 9 to 13 in. high, hispidly hirsute; leaves round or oblong-ovate, subcordate, crenately toothed, crisped, 6 to 9 lines long, the radical oblong or oblong-spatulate, narrowed to a petiole, $1\frac{1}{4}$ in. long; petals 1 line long; capsule quadrangular, 8 lines long, contorted, not spirally coiled or rarely, submembranous as in the next two species.

Dry mountain ridges: Lake Co.; Vaca Mts.; Mt. Diablo; Pajaro Hills. May. This and the two species preceding have radical leaves in a tuft or rosette, in this species disappearing rather early. The next two species are without a radical rosette or tuft.

9. *O. strigulosa* T. & G. Stems and branches slender, 4 to 10 in. high, at first strict, at length diffusely branched; wholly glabrous or minutely pubescent with short scattered hairs, the ovaries gray-pubescent; leaves linear, remotely low-denticulate, most of them $\frac{1}{2}$ in. long; petals 1 to 2 lines long, yellow, aging to bright red; anthers innate; capsule linear, straight, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, $\frac{1}{4}$ line wide.

Common throughout California, especially in sandy soil: Mendocino Co.; Yuba Co.; Calistoga; Alameda; San Francisco; Southern California. May-June.

10. *O. dentata* Cav. Branched from the base, bushy, 9 in. high; sparsely pubescent with short stiff spreading hairs; leaves linear, mostly tapering to both ends, denticulate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, often with smaller leaves fascicled in the axils; petals yellow changing to dull red, round-obovate, 2 to 3 lines long; anthers versatile; capsule similar to no. 9, 1 in. long, arcuate-recurved. —(*O. campestris* Greene.)

Antioch and common southward on the sandy San Joaquin plains. Apr.

June. Var. *CRUCIATA* Wats. has narrowly obovate or oblong petals one-half as large.

GAYOPHYTUM Juss., approaches *Oenothera*; very slender annuals; flowers small, white or pink; ovary 2-celled.—The following grow in the Sierra Nevada. *G. LASIOSPERMUM* Greene; flowers small, the petals about $\frac{1}{2}$ line long; seeds canescent with appressed hairs (as also in next). *G. ERIOSPERMUM* Coville; flowers large, $1\frac{1}{2}$ to 3 lines long. *G. RAMOSISSIMUM* T. & G.; much-forked above, mostly remotely leafy; pedicels filiform, elongated; petals $1\frac{1}{2}$ to 3 lines long; stigma rather small; capsule subclavate, mostly torulose; seeds glabrous (as in all the following), rather few, large, papillate, mostly dark colored.—A common species. *G. DIFFUSUM* T. & G.; like preceding but small-flowered, the petals $\frac{1}{2}$ to 1 line long. *G. PUMILUM* Wats.; low, simple or paniculately few-branched toward the base, densely leafy; pedicels short or nearly none; petals $\frac{1}{2}$ line long; stigma large, capitate; capsule neither clavate nor conspicuously torulose; seeds numerous, smooth.

10. *CIRCAEA* L. ENCHANTER'S NIGHTSHADE.

Low slender perennials with thin opposite petioled leaves. Flowers small, white, in terminal and lateral racemes. Calyx-tube slightly produced beyond the ovary, the base nearly filled by a cup-shaped disk, deciduous; lobes 2, reflexed. Petals 2, obovate. Stamens 2, alternate with the petals. Ovary 1 or 2-celled, each cell 1-ovuled. Fruit 1-celled, 1-seeded, indehiscent, pear-shaped and bristly with hooked hairs. (Circe, sea-nymph, daughter of the Sun and of Perse.)

1. *C. pacifica* Asch. & Mag. Stem from a short rootstock, usually simple, 6 to 14 in. high; herbage glabrous; leaves orbicular to mostly ovate, obtuse to cordate at base, acuminate, obscurely repand-denticulate or almost entire, 1 to 2 in. long, on petioles $\frac{3}{4}$ to 1 in. long; racemes bractless; flowers $\frac{1}{2}$ line long; calyx white, with a very short tube; fruit $\frac{3}{4}$ to 1 line long.

Deep shades of woods: Olema Creek, Marin Co., *Eastwood* (*Erythra*, vi, 117); Calito (Mendocino Co.) to Mt. Shasta, thence southward in the Sierra Nevada at middle altitudes. Infrequent. July.

HALORAGEAE. WATER-MILLFOIL FAMILY.

Perennial aquatic herbs, the leaves (in ours) in whorls. Flowers sessile in the axils of leaves or bracts, perfect or unisexual. Calyx-tube coherent with the ovary, the limb very short or obsolete. Petals small or none. Stamens 1, 4, or 8. Ovary 1 to 4-celled; stigmas 1 to 4. Fruit a 1-seeded indehiscent nutlet, or 4-lobed and splitting into 4 nutlets.

Leaves all entire; flowers perfect; stamen 1; ovary 1-celled.....1. *HIPPURIS*.
Immersed leaves capillary dissected; flowers polygamous; stamens 4 or 8; ovary 4-celled...

2. *MYRIOPHYLLUM*.

1. *HIPPURIS* L. MARE'S TAIL.

Stems erect, unbranched. Leaves simple, entire. Flowers minute, usually perfect, sessile in the axils. Petals none. Calyx limb a narrow entire rim. Stamen 1, inserted on the anterior edge of the calyx. Style 1, filiform, stigmatic down one side. Ovary 1-celled, becoming a 1-seeded nutlet. (Greek hippos, a horse, and oura, a tail.)

1. *H. vulgaris* L. Stem simple, 1 to 2 ft. long (commonly emersed 4 to 7 in.); herbage glabrous; leaves about 7 to 10 in a whorl, linear, acute, $\frac{1}{2}$ in. long; fruit nearly 1 line long.

Shallow margins of ponds and about springs: Tomales Bay (Bot. Cal. i, 215); Sierra Nevada.

2. MYRIOPHYLLUM L.

Leaves alternate, or (in ours) whorled, the emersed ones entire or pectinate, those under water pinnately divided into capillary divisions. Flowers sessile in the axils of the upper leaves or forming a terminal interrupted spike. Upper flowers generally staminate, the lowest pistillate, and the intermediate often perfect. Calyx of the pistillate flowers 4-toothed or the teeth none, of the staminate 4-lobed. Petals 4, or none. Stamens 4 or 8. Stigmas 4, recurved and plumose. Fruit splitting at maturity into 4 bony 1-seeded nutlets. (Greek *muri*os, a thousand, and *phallon*, a leaf.)

Flowers in a terminal interrupted spike; petals early deciduous; stamens 8.....

1. *M. spicatum*.

Flowers in the axils of the emersed linear leaves; petals subpersistent; stamens 4.....

2. *M. hippurioides*.

1. *M. spicatum* L. WATER-MILFOIL. Stems branching, 1 to 2 ft. long; leaves in whorls of 3 or 4, dissected into capillary divisions; floral leaves or bracts ovate, entire or serrate and usually shorter than the flowers, which thus form an interrupted spike 1 to 4 in. long; nutlets 1 line long, fully as thick, rounded on the back with a deep groove between them.

Lakes and ponds: San Francisco Peninsula; Marin Co., *Behr*. July-Aug.

2. *M. hippurioides* Nutt. Leaves in whorls of 4 or 5; emersed ones linear, serrate or the uppermost nearly entire, 3 to 5 lines long; submersed ones dissected into capillary divisions, 1 to 1½ in. long; flowers chiefly in the axils of the emersed leaves; petals white, obovate; nutlets less rounded.

Lake Co., *Jepson*; Stockton, *Sanford*.

ARALIACEAE. ARALIA FAMILY.

Ours herbs but the foreign species commonly shrubs or trees. Very closely allied to Umbelliferae, but the stems solid, the petals not inflexed and the ovary 2 to 5-celled. Petals, stamens and styles 5. Calyx-tube coherent with the ovary, its limb a mere rim with 5 salient teeth. Fruit berry-like, containing as many 1-seeded nuts as there are carpels.—The cultivated Ivy, *Hedera helix* L., belongs to this family and climbs by its adventitious roots.

1. ARALIA L.

Perennial herbs with alternate compound leaves and whitish flowers in panicle umbels. Embryo minute. (Derivation uncertain.)

1. *A. californica* Wats. GINSENG. Stems simple, stout, 6 to 10 ft. high, from a large rootstock with milky juice; herbage glabrous, subulate-scabrous on the main stem; leaves ternate, then pinnately 3 to 5-foliate, 1 to 5 ft. long; leaflets ovate, sometimes elliptic, serrate, acuminate, subordinate at base, ½ to 1 ft. long; flowers 1½ lines long, on pedicels ½ in. long; panicle 1 to 1½ ft. long; ovary red, becoming a globular black berry 2½ lines in diameter.

Shaded cañons and beds of mountain streams. Coast Ranges (except the inner ranges): Santa Lucia Mts.; Oakland Hills; Mt. Tamalpais; Inverness; Del Norte Co. Sierra Nevada.

UMBELLIFERAE. PARSLEY FAMILY.

Herbs with commonly hollow stems and often dilated petioles. Leaves alternate or radical (opposite in Bowlesia and in some Eryngium species), com-

pound (sometimes simple), usually much incised or divided. Flowers small, in compound umbels, or the umbels sometimes simple or capitate. Umbels, when compound, with the peduncle divided at summit into a number of rays, each ray bearing a secondary umbel termed an umbellet. Umbellets commonly subtended by bractlets (forming an involucler); rays commonly subtended by bracts (forming an involucre). Calyx-tube wholly adnate to the ovary; calyx-teeth small, sometimes obsolete. Petals 5, usually with an inflexed tip. Stamens 5, inserted on an epigynous disk. Ovary inferior, 2-celled, one hanging ovule in each cell. Styles 2, united below and forming a swollen or cushion-like base (stylepodium). Fruit consisting of two carpels united by their faces (commissure), flattened laterally (*i. e.*, flattened sidewise or contrary to the commissure), or flattened dorsally (*i. e.*, each carpel flattened on the back or parallel with the commissure), or not flattened at all. Each carpel with 5 ribs or ridges, one down the back (dorsal rib), 2 on the edge near the commissure (lateral ribs), and 2 between the dorsal and lateral ribs (intermediate ribs). Between the ribs are the spaces called intervals:—the dorsal intervals are those next to the dorsal rib; the lateral intervals are those next to the lateral ribs. Beneath the intervals (in the tissue of the pericarp), as also on the commissural side or “face,” are oil-tubes. Carpels 1-seeded, splitting apart at maturity, each borne on a filiform division of the receptacle (or carpophore) which is prolonged between them. The “seed-face” is against the commissure. Embryo small; endosperm cartilaginous.—The inflorescence is frequently irregularly compound; in a few genera the fruit has no ribs, and in others no oil-tubes. The number of oil-tubes in a given species, is, generally speaking, a reliable character but it should be noted that there is here, also, more or less variation. The character of the ribs and oil-tubes should be ascertained by examination of perfectly mature fruit.—Many of the species are poisonous or have poisonous parts, although many others, such as Parsley, Carrot and Parsnip, have edible organs and are classed as food plants.

A. Fruit covered with prickles, tubercles, or scales, or the ribs bristly.

Fruit bearing an elongated beak several times longer than the body; oil-tubes none; annuals 5. SCANDIX.

Fruit not produced into a beak.

Oil-tubes obscure; perennials.

Fruit covered with hyaline scales; ribs none; flowers greenish white or bluish, in dense peduncled heads; prickly herbs..... 3. ERYNGIUM.

Fruit bur-like, covered with hooked prickles; ribs none; flowers yellow, or purple in one species, mostly in head-like clusters..... 4. SANICULA.

Fruit elongated, its ribs upwardly bristly; flowers white, in compound umbels..... 6. OSMORRHIZA.

Oil-tubes conspicuous; flowers white; annuals or biennials.

Ribs armed with barbed or hooked bristles.

Fruit somewhat flattened dorsally; calyx-teeth obsolete; umbels compound..... 7. DAUCUS.

Fruit flattened laterally; calyx-teeth obvious; umbels simple or nearly simple..... 8. CAUCALIS.

Ribs inconspicuous; fruit papillate-roughened; umbels irregularly compound; di- or tri-chotomous branching annual..... 9. APIASTRUM.

B. Fruit not prickly, nor tuberculate, nor scaly (sometimes hairy).

Leaves opposite; fruit ovate, turgid; ribs none; slender annuals..... 1. BOWLESIA.

Leaves alternate or in a radical tuft; perennials or biennials.

Leaves simple; stems creeping; umbels simple or proliferous.

Leaves orbicular or peltate; oil-tubes none..... 2. HYDROCOTYLE.

Fruit consisting of hollow cylindrical petioles; oil-tubes solitary..... 19. LILAEOPSIS.

Leaves pinnately or ternately compound, or decomposed; umbels compound.

- Fruit not flattened dorsally, sometimes somewhat laterally flattened; ribs not winged.
 Flowers white, or at least not yellow.
 Styles in fruit strongly recurved or deflexed.....16. *EULOPHUS*.
 Styles not deflexed.
 Oil-tubes none.
 Fruit linear or elongated, $\frac{1}{2}$ to 1 in. long.....6. *OSMORRHIZA*.
 Fruit ovate, $\frac{1}{2}$ lines long.....10. *CONIUM*.
 Oil-tubes present.
 Oil-tubes solitary in the intervals.
 Umbels subsessile in the forks and terminal on the branches; fruit less than 1 line long.....12. *APIUM*.
 Umbels terminal on the branches.
 Leaves pinnate or bipinnate.
 Leaflets serrate; plants of marshes or stream banks.
 Ribs corky, but distinct.
 Styles short13. *CICUTA*
 Styles elongated 20. *OENANTHE*.
 Ribs confluent, forming a continuous corky covering.....21. *BERULA*.
 Leaflets entire; ribs filiform; plants of dry ground.....15. *CARUM*.
 Leaves tritermately dissected; fruit less than 1 line long.....14. *AMMI*.
 Oil-tubes 2 or more, at least in some of the intervals.
 Leaves simply pinnate; bracts and bractlets present.....18. *Sium*.
 Leaves 2 or 3 times ternate; bracts and bractlets mostly none.....17. *PIMPINELLA*.
 Flowers yellow.
 Rather low plants; leaves mostly radical; leaflets broad.....11. *VELAEA*.
 Tall leafy plants; leaves dissected into filiform segments.....22. *FOENICULUM*.
 Fruit flattened dorsally; lateral ribs winged.
 Oil-tubes as long as the fruit.
 Dorsal and intermediate ribs winged or very prominent; flowers white; tall and leafy plants.
 Leaves pinnate; oil-tubes solitary in the intervals.....23. *SELINUM*.
 Leaves ternate, then pinnate; oil-tubes 1 to 3 in the intervals....24. *ANGELICA*.
 Dorsal and intermediate ribs filiform.
 Acaulescent or short-caulescent.
 Wings corky-thickened; flowers commonly yellow; tall plants with large leaves25. *LEPTOTAENIA*.
 Wings thin; flowers yellow, white or purple; low plants.....26. *PEUCEDANUM*.
 Stems tall, angular and channeled, branching and leafy; flowers yellow.....27. *PASTINACA*.
 Oil-tubes reaching only half way to the base of the fruit; marginal flowers of umbel with radiately enlarged corollas; tall coarse plants.....28. *HERACLEUM*.

1. BOWLESIA R. & P.

Delicate annuals with stellate pubescence, opposite simple leaves and scarious lacerate stipules. Umbels simple, few-flowered, on short axillary peduncles. Flowers white, minute. Calyx-teeth prominent. Fruit ovate, somewhat flattened laterally, with narrow commissure; carpels turgid, becoming depressed on the back. Ribs and oil-tubes none. (Wm. Bowles, 1705-1780, Irish naturalist and traveler.)

1. *B. lobata* R. & P. Stems mostly branching at the base, weak and trailing, $\frac{1}{2}$ to 2 ft. long, flowering from the base; leaves thin, mostly 5-lobed, broader than long, usually heart-shaped at base, the lobes entire or some of them 1 or 2-toothed, $\frac{1}{2}$ to 1 in. broad; petioles 1 to 3 in. long or the upper shorter; umbels 1 to 4-flowered; fruit 1 line long.

Shaded places in the hills: Coast Ranges(Petaluma, Berkeley, San Francisco); Sierra Nevada to Southern California, eastward to Arizona and Texas. Coulter and Rose have named the North American plant *B. septentrionalis* (Mong. Umbel., p. 31). Our plants may well be distinct from any South American forms and if so the distinction is susceptible of expression in terms of plant structure as well as of geography.

2. HYDROCOTYLE L.

Perennial herbs without erect stems, the peduncles and leaves from creeping stems or rootstocks. Leaves simple, round in outline, long-petioled. Flowers in a small umbel, or disposed in 2 or more umbels which are proliferous one above the other. Fruit flattened laterally, suborbicular, acutely margined and with one or 2 ribs on each side. Oil-tubes none. (Greek hudor, water, and cotule, a low vessel, the peltate leaves of some species being saucer-shaped.)

Leaves not peltate, 5 or 6-cleft; umbels simple.....1. *H. ranunculoides*.
Leaves peltate, slightly crenate; umbels proliferous.

Fruit notched at base and apex.....2. *H. prolifera*.
Fruit not notched3. *H. cuneata*.

1. *H. ranunculoides* L. f. WATER PENNYWORT. Stems floating or creeping in mud, rooting at the nodes; herbage glabrous; leaves orbicular, 5 or 6-cleft, the lobes crenate, $1\frac{1}{2}$ in. broad or less; petioles 3 to 5 in. long; peduncles 1 to 2 in. long, reflexed in fruit; pedicels $\frac{1}{2}$ line long; fruit ovoid, 1 line broad or broader; ribs obscure.

Pools or muddy shores, often floating in rather deep water: San Francisco to San Jose, south to Southern California, north to Washington and east across the continent.

2. *H. prolifera* Kell. MARSH PENNYWORT. Descending branches of the rootstock tuberous-enlarged; umbels proliferous, one above the other in 3 or 4 whorls (each whorl 5 to 15-flowered); leaves orbicular-peltate, emarginate at base, slightly crenate, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. broad, petioles 10 to 13 in. long; peduncles nearly as long; pedicels 1 to 3 lines long; mature fruit 1 line long and slightly broader, slightly notched at base and apex.

Marshes about San Francisco, thence to the lower Sacramento and lower San Joaquin rivers.

3. *H. cuneata* C. & R. Habit of *H. prolifera*; fruit tapering to the pedicel by a very distinct cuneate base.

Suisun Marshes to Southern California, thence east to Texas.

3. ERYNGIUM L. BUTTON SNAKEROOT.

Perennials with clustered fibrous roots, often dichotomously branching stems, prickly involucre and often prickly leaves. Leaves opposite, or the upper sometimes alternate, simple, commonly oblanceolate and spinulose-serrate or incised, or the radical, when growing in water, with fistulous petioles and the blade more or less obsolete. Flowers greenish white or bluish, condensed in heads; heads terminal on the branches or on short peduncles in the forks; bracts spinose, conspicuous; bractlets usually spinose-tipped. Calyx-lobes persistent on the fruit. Fruit covered with whitish thin scales; ribs obsolete. Oil-tubes none. (Greek name used by Dioscorides.)

Heads greenish.

Calyx-lobes in fruit longer than the styles.

Bracts and bractlets entire, callous-margined.....1. *E. armatum*.

Bracts and bractlets spinulose, at least toward the base.....2. *E. vaseyi*.

Calyx-lobes in fruit shorter than the styles.....3. *E. jepsonii*.

Heads very blue4. *E. articulatum*.

1. *E. armatum* C. & R. COAST ERYNGO. Diffusely branching, the stems 3 to 5 or 10 in. long; leaves broadly oblanceolate, incised or merely serrate, the teeth spinose; bracts and bractlets very prominent, broadly lanceolate, strongly spinose-tipped, with an entire callous margin, sometimes scarious-

winged at the very base, 7 lines long or less; calyx-lobes longer than the styles, narrowed at apex into a sharp point or cusp.

Lowlands near the coast from Monterey to Berkeley, Pt. Reyes and Petaluma; often abundant.

2. *E. vaseyi* C. & R. COYOTE-THISTLE. Plants growing in shallow vernal pools and showing two vegetative stages: earliest leaves all fistulous, jointed, and radical, disappearing with the drying up of the pools and succeeded by leafy stems; stems stout, erect, more or less branching, commonly 8 to 13 in. (or sometimes 2 ft.) high; lower leaves narrowly oblanceolate, spinulose, somewhat incised or bearing small lanceolate lobes below, 4 to 8 in. long, the upper much shorter; bracts spinose, spinulose toward the base, 6 to 10 lines long, much surpassing the bractlets; bractlets surpassing the flowers, similar; fruit with abruptly cuspidate calyx-lobes longer than the short styles.

Low places in fields, Sacramento and San Joaquin valleys and west to Monterey Co. May-June.

3. *E. jepsonii* C. & R. BUTTON-THISTLE. Plants growing in shallow vernal pools, the earliest leaves all fistulous and radical, jointed at intervals ($\frac{1}{2}$ to 2 in.), $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long; fistulous leaves disappearing with the drying up of the pools and leafy stems arising; stems slender, freely branching, $1\frac{1}{4}$ to $1\frac{3}{4}$ ft. high; leaves oblanceolate, spinulose, sometimes incised, narrowed at base to a slender spinulose petiole; heads $1\frac{1}{2}$ to 3 or 4 lines broad, surpassed by the bracts; bracts about 5 to 10 lines long, with few short bristles at base; bractlets with a broad scarious margin at base, not spinulose; calyx-lobes oblong or lanceolate, cuspidate, much shorter than the long styles.—(*E. californicum* Jepson.)

Low places in valley fields and flats in the hills: Alameda and Napa cos., and north and south in the Coast Ranges.

4. *E. articulatum* Hook. BLUE-THISTLE. Erect, sparingly branched above, 2 to 3 ft. high; herbage with a strong disagreeable odor; lower leaves fistulous, elongated, jointed; upper leaves sometimes opposite; heads ovoid, 4 to 7 lines high; bracts narrowly linear, elongated, more or less spinulose-serrate; bractlets blue, lanceolate, entire, more or less scarious-margined; calyx-lobes bluish, lanceolate, equaled by the styles.

Suisun Marshes, lowlands along sloughs of the lower Sacramento River and north to Oregon and Idaho. A bee-plant; "in western Sacramento Co. bees will gather 100 pounds to the hive this fall season."—M. C. Richter, 1910.

4. *SANICULA* L. SNAKE-ROOT.

Glabrous perennials with naked or few-leaved stems, usually much-divided leaves, and irregularly compound few-rayed umbels. Involucres of leaf-like toothed bracts. Involucels of small usually entire bractlets. Flowers greenish, yellow or purple, of two sorts, perfect (fertile) and staminate (sterile), both kind in the same umbellet, the staminate often pediceled. Umbellets capitate and here called heads. Calyx-teeth slightly foliaceous, persistent. Fruit subglobose or obovoid, without ribs, densely covered with tubercles which end in hooked prickles. Oil-tubes many and irregularly distributed. (Diminutive form, derived from Latin *sanare*, to heal, certain species used in medicine.)

A. Fruit pediceled or stipitate; leaves palmately lobed or divided; stem or stems from a stoutish taproot.

Bractlets conspicuous, much exceeding the heads; plants prostrate or decumbent.....

Bractlets inconspicuous, not exceeding the heads; plants erect.....

1. *S. arctopoides*.

2. *S. menziesii*.

B. Fruit neither pediceled nor stipitate.

Stem or stems from the more or less thickened crown of a taproot.

Flowers purple; leaves bipinnatid, the main divisions decurrent on the toothed rachis; hill species.....3. *S. bipinnatifida*.

Flowers yellow.

Leaves entire or some 3-parted; Bay flats.....4. *S. maritima*.

Leaves palmately cleft or divided (the main divisions confluent below); coast species...5. *S. laciniata*.

Stem from a tuber.

Leaves twice or thrice pinnate, of distinct small leaflets; tuber vertically elongated....6. *S. bipinnata*.

Leaves twice or thrice ternate, then pinnately dissected; tuber globose....7. *S. tuberosa*.

1. **S. arctopoides** H. & A. **YELLOW MATS.** Prostrate or decumbent, the plants $\frac{1}{3}$ to 1 ft. in diameter, conspicuous because of the yellowish foliage; main stem from a taproot, short, bearing a tuft of leaves and several divergent naked branches often longer than the leaves, each bearing an umbel of 1 to 4 rays; rays short or as much as 5 in. long; leaves 2 to $2\frac{1}{2}$ in. broad, 2 to $4\frac{1}{2}$ in. long including the broadly margined petiole, palmately parted into 3 divisions which are again cleft, the whole margin laciniately cut into slender unequal teeth, almost as if fringed, or again, the lanceolate spreading segments subentire; bracts similar; heads 3 lines in diameter, surrounded by conspicuous involucrels of 8 to 13 oblong entire bractlets 5 to 7 lines long, or 4 or 5 much shorter than the others; flowers yellow; fruit 1 to $1\frac{1}{2}$ lines long, naked at base, with long bristles above.

Open or brushy hills of the seaward Coast Ranges from Monterey to San Francisco, Mt. Tamalpais, Mendocino and northward to British Columbia.

2. **S. menziesii** H. & A. **GAMBLE-WEED.** Stem 1 to $3\frac{1}{2}$ ft. high, one from a stoutish taproot, simple below, paniculately branching above, 1 to 2 ft. high; leaves round-cordate in outline, 1 to 2 in. broad, palmately and deeply 3 to 5-lobed, the broad segments sharply lobed or incised with mucronate teeth, but not toothed to the very base; rays few, $\frac{1}{4}$ to 2 in. long; bracts small, leaf-like; bractlets 6 to 8, small, entire; flowers yellow, the sterile ones short-pediceled or nearly sessile; fruits covered with strong bristles, $1\frac{1}{2}$ lines long, distinctly stipitate, 4 to 9 in. each head, at length divergent.

Shady woods of the hills from Southern California to British Columbia in both the Coast Ranges and Sierra Nevada, common.

Var. **nudicaulis** Jepson, n. comb. Branches sub-basal, scapiform; leaves long-petioled, thinnish, less deeply parted, sinuses more nearly closed and the segments less lobed; bracts leaf-like, broad.—“California, Douglas,” described from the specimen in the Kew Herbarium (*S. nudicaulis* H. & A.).

The following species of the Sierra Nevada have the leaves ternate with the main divisions on distinct petiolules: *S. NEVADENSIS* Wats. Sierra Sanicle. Plants low, the spreading peduncles arising in a cluster from near the base.—Alt. 5,000 to 6,000 ft. *S. SEPTENTRIONALIS* Greene. Plants erect, the peduncles arising singly along the stem.—Nevada Co. northward to British Columbia.

3. **S. bipinnatifida** Dougl. **PURPLE SANICLE.** Plants $\frac{1}{2}$ to 3 ft. high, the herbage disposed to be purplish; taproot deep-seated, its thickened multicapital crown bearing a cluster of leaves and several stems, which are leafy mainly or wholly towards the base; leaves $2\frac{1}{2}$ to 4 in. long, mostly triangular in outline, pinnately 3 to 7-parted, the divisions distant, decurrent on the rachis as a toothed wing, and cut into oblong or ovate unequally toothed or serrate lobes; flowers purple, borne in dense heads $2\frac{1}{2}$ to 4 lines in diameter, the sterile

pediceled; umbels irregular, with long or short rays, small leaf-like bracts and small lanceolate bractlets; fruit covered all over with bristles.

Grassy slopes in the hills: Coast Ranges and the Sierra Nevada foothills southward to Southern California and northward to the Columbia River. Common.

4. **S. maritima** Kell. DOBIE SANICLE. Plants 12 to 15 in. high, the stout stem from a much-thickened root; basal leaves rather numerous, elliptical to orbicular, entire or slightly serrate, 1 to 3 in. long on petioles 4 to 6 in. long; cauline leaves few, 3-parted into obovate or roundish divisions (as are sometimes the basal leaves) with sub-entire or coarsely toothed margins; peduncles few, elongated; umbel with 1 to 4 rays 1 to $2\frac{1}{2}$ in. long; involucre of leaf-like bracts; involucre of many small lanceolate bractlets; flowers yellow, the sterile ones short-pediceled; fruit bristly, somewhat naked below, $1\frac{1}{2}$ lines long; seed-face concave, with a very prominent median longitudinal ridge.

Local species of low and wet adobe lands in the vicinity of salt-marshes bordering San Francisco Bay; near Alameda (where collected by Dr. Kellogg) and Potrero hills, San Francisco, the only recorded localities.

5. **S. laciniata** H. & A. COAST SANICLE. Plants 6 to 15 in. high; stem from a medium taproot, the branches few and disposed to diverge; leaves mainly basal, roundish in outline, $\frac{1}{2}$ to 1 in. long, palmately 3-cleft or -parted, the divisions incisely lobed or laciniate with spreading teeth, their petioles 1 to 2 in. long, upper leaves and foliaceous involucres similar but reduced; umbel with 2 to 5 unequal rays ($\frac{1}{3}$ to $1\frac{1}{2}$ in. long), or one or two of the rays again umbellate; flowers yellow, subtended by an involucre of oblong-ovate or lanceolate bractlets 1 line long; sterile flowers long-pediceled; fruit prickly, somewhat naked below, $1\frac{1}{2}$ lines long.

Slopes of the coast hills from Mendocino Co. to San Diego. Apr.

6. **S. bipinnata** H. & A. POISON SANICLE. Plant erect, the herbage with a strongly aromatic odor; stem from an elongated tuber-like root, usually simple below, $\frac{3}{4}$ to 2 ft. high; leaves chiefly basal, 2 to 3 in. long, twice or thrice pinnate, the ultimate divisions obovate or oblong, 3 to 4 lines long, not decurrent; umbel with 3 or 4 rays and leaf-like bracts; flowers yellow, the heads 2 lines in diameter and subtended by several small more or less united bractlets; fruit tuberculate, the tubercles tipped with stout hooked bristles.

Shady woods in the low hills: Coast Ranges and Sierra Nevada. Apr. Reputed poisonous to cattle.

7. **S. tuberosa** Torr. TURKEY-PEA. Stem from a globose tuber, 5 to 9 in. high, simple or divided at or near the surface of the ground into 2 to 5 long peduncle-like often divergent branches, each irregularly di- or tri-chotomous, the divisions ending in 1 to 4-rayed umbels and commonly with pedunculate heads in the forks; leaves once or twice ternate, then pinnatifid, usually very finely dissected into acutish segments; involucres of leaf-like bracts; involucre of small ovate or lanceolate partially united bractlets; heads 2 to 3 lines broad; flowers yellow, the sterile on pedicels 1 to 3 lines long; fruit flattened laterally, tuberculate but not at all bristly, 1 line long.

Rocky or gravelly slopes in the foothills and up to 5,000 ft., Coast Ranges and Sierra Nevada, southward to San Diego and Lower California.

S. SAXATILIS Greene. Stems numerous, from a thick root, branching and spreading from the base; ultimate leaf-segments broad, coarsely toothed; flowering branches repeatedly di-chotomous; flowers salmon-color; upper tubercles

on the fruit tipped with a reduced subulate and hooked bristle; otherwise like *S. tuberosa*.—Summit of Mt. Diablo, *Greene*, June, 1892.

5. SCANDIX L.

Annuals with dissected decompound leaves. Flowers white, polygamous, in compound umbels. Staminate flowers with stamens and green disk, and occasionally with short styles; pistillate flowers with long styles, purple disk and no stamens. Rays commonly 2, rarely 1 or 3. Involucre none or of one bract. Involucrels of several bractlets. Petals unequal, the outer larger. Fruit linear, flattened laterally, muricate, prolonged into a beak several times longer than the body. Ribs prominent. Oil-tubes none. Seed-face sulcate. (The Greek name.)

1. *S. pecten-veneris* L. SHEPHERD'S NEEDLE. Erect, simple or branching, 5 to 16 in. high, somewhat hispidulous; leaves 2 or 3 times pinnately dissected into linear acute segments less than $\frac{1}{2}$ line wide; bractlets 2 or 3-toothed at apex or entire; rays $\frac{1}{2}$ to 1 in. long; pedicels very short; body of fruit 4 lines long, bearing a straight flattish beak $1\frac{1}{4}$ in. long, its edges hispidulous.

Naturalized from Europe: Napa Valley; Sonoma Valley; Santa Rosa; Olema (1910); Berkeley.

6. OSMORRHIZA Raf. SWEET CICELY.

Perennials with thick aromatic roots. Leaves mostly radical and ternately compound. Flowers white, in compound umbels. Calyx-teeth obsolete. Involucre reduced or obsolete. Involucrels present or none. Fruit linear or linear-oblong, acute at summit, rather prominently attenuate at base; glabrous and smooth or bristly along the ribs; carpels pentagonal in cross section, with equal ribs. Oil-tubes none in mature fruit. Seed-face concave to very deeply sulcate. (Greek osme, odor, and rhiza, root.)

1. *O. nuda* Torr. COMMON SWEET CICELY. Stems glabrous, $2\frac{1}{2}$ ft. high or less; leaves hispidulous, especially on the petioles, biternate, 5 in. long, the cauline much reduced; leaflets ovate or elliptical, 3-lobed or -cleft and serrate, often narrowly or broadly cuneate at the entire base, $\frac{1}{2}$ to $2\frac{1}{2}$ in. long; rays 2 to 4 in. long or less; pedicels 4 to 7 lines long; involucrels none; fruit slenderly attenuate at base, upwardly bristly on the ribs, 7 or 8 lines long; seed-face sulcate.

Common in shady woods near the coast: Napa Valley; Mt. Tamalpais; Berkeley; Mt. Diablo; San Mateo; Santa Cruz.

O. BRACHYPODA Torr. Erect, $1\frac{1}{2}$ to $1\frac{3}{4}$ ft. high, nearly or quite glabrous; leaves ternately compound; leaflets laciniately cleft and serrate, mucronulate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; umbel 1 to 4-rayed, rays 2 in. long; pedicels 1 line long; involucre mostly absent; involucrels of linear acuminate bractlets; fruit 7 to 9 lines long, the ribs armed with bristles pointed upward; seed-face deeply concave or even involute.—Sierra Nevada; Monterey Co. (acc. Bot. Cal.).

O. OCCIDENTALIS (Nutt.) Torr. Sierra Sweet Cicely. Puberulent or nearly glabrous; leaves 2 or 3 times ternate; leaflets oblong-lanceolate, serrate, $1\frac{1}{2}$ to $3\frac{1}{4}$ in. long, some of them sparingly incised or obliquely lobed on one side by a deep incision toward the base; umbel with 5 to 12 rays 1 to 5 in. long; pedicels 1 to 3 lines long; bracts 1 or 2 or none; fruit 7 to 12 lines long, glabrous, with prominent acute not bristly ribs; seed-face very concave.—Sierra Nevada; attributed to the Bay region by Greene.

7. DAUCUS L.

Bristly or hispid annuals or biennials with dissected decompound leaves and

white flowers. Umbels compound, concave, surrounded by cleft foliaceous bracts and borne on long peduncles. Involucre of entire or toothed bractlets. Calyx-teeth obsolete. Fruit somewhat flattened dorsally. Primary ribs slender, bristly; secondary ribs with a single row of prominent barbed prickles. Oil-tubes as in *Caucalis*. (*Daukos*, the Greek name.)

Involucre divided into short linear or lanceolate segments; rays mostly 2 to 5 lines long or more1. *D. pusillus*.
Involucre divided into elongated filiform segments; rays 1 to 2½ in. long....2. *D. carota*.

1. ***D. pusillus*** Michx. RATTLESNAKE WEED. Plants 4 to 7 in. high; stems and peduncles retrorsely hispid; leaves finely dissected into linear segments; rays mostly 2 to 5 lines long, sometimes as much as 1 or 1½ in. long, somewhat unequal; pedicels very unequal, commonly 1 or 2 lines long or almost wanting; fruit 1½ to 2 lines long.

Throughout California in the hill country. Apr. The herbage is in rural repute as an antidote for the bite of the rattlesnake, whence "*Yerba de Vibora*" of the Spanish-Californians.

2. ***D. carota*** L. CARROT. Biennial; root fleshy, conical; stems erect, branching, hispid, 2 or 3 ft. high; leaves many times dissected into small linear or lanceolate segments; segments of the involucre linear-lanceolate or subulate; rays very numerous, 1 to 2 in. long; umbels in fruit 2 to 4 in. broad, concave and like a bird's nest; fruit 2 lines long.

An escape from gardens, locally naturalized in valley lands: Alameda; Santa Clara Co.

8. CAUCALIS L.

Rough hispidulous annuals with decompound leaves dissected into small segments. Flowers white, in simple or nearly simple umbels. Calyx-teeth prominent. Fruit flattened laterally. Primary ribs 5, filiform, bristly; secondary ribs 4, prominent, winged, bearing barbed or hooked prickles. Oil-tubes solitary in the intervals, *i. e.*, under the secondary ribs, 2 on the face. (*Kaukalis*, the Greek name.)

Umbels small and condensed, scattered along the stems opposite the leaves, on peduncles 1 or 2 lines long1. *C. nodosa*.
Umbels terminal or at the upper nodes, on peduncles 1 to 2 in. long....2. *C. microcarpa*.

1. ***C. nodosa*** Hudson. KNOTTED HEDGE PARSLEY. Erect, the stems with few branches, retrorsely scabrous; leaves pinnate (lower 5 in. long including petiole, the upper successively shorter); leaflets bipinnately dissected; umbels scattered along the stems opposite the leaves, on very short peduncles (1 or 2 lines long), simple or with a supplementary short proliferous umbel; flowers white; fruits 1½ to 2 lines long, those on the outside of the umbel with the exterior carpel densely covered with hooked bristles, the inner carpels as well as the inner fruits smooth or at least only with tubercles.

Naturalized from Europe, locally common on openly wooded hills: Vacaville; Napa Valley; Marin Co.; Mokelumne Hill (1894); Folsom (1883).

2. ***C. microcarpa*** H. & A. Erect, slender, 6 to 9 in. high; leaves 2 or 3 times ternate and much dissected, slightly hispid; peduncles solitary at the ends of the branches or in clusters of 2 or 3 at the upper nodes, 1 to 2 in. long, bearing unequally rayed umbels; rays 3 to 6, 8 lines long or less; involucre of foliaceous dissected bracts; involucre of entire or somewhat divided bractlets; fruit oblong, 2 lines long, armed with rows of hooked prickles.

Coast Ranges and Sierra Nevada, widely distributed but not common: Santa

Lucia Mts.; New Idria; Bodega Pt.; Vaca Mts.; Hupa Valley; Sites; Moke-lumne Hill; Kaweah.

9. APIASTRUM Nutt.

Small branching glabrous annual with dissected leaves. Flowers small, white, in irregularly compound umbels. Rays and pedicels unequal. Involucre and involuclcs none. Calyx-teeth wanting. Fruit somewhat laterally compressed, elliptic-cordate, more or less tuberculate. Oil-tubes solitary in the intervals, 2 on the face. Seed-face narrowly concave. (Apium, Celery, and aster, Latin suffix meaning wild.)

1. *A. angustifolium* Nutt. Erect, di- or tri-chotomously branched from the base, 4 to 8 (or 15) in. high; leaves opposite below, twice or thrice ternately dissected into linear segments $\frac{1}{2}$ to 1 in. long; umbels sessile in the forks or opposite the upper leaves, consisting of 2 or 3 umbellets borne on unequal rays (1 in. long or less), and of 1 or 2 usually sessile or sometimes pediceled flowers in the center; umbellets 3 or 4-flowered, the pedicels unequal ($4\frac{1}{2}$ lines long or less) or 1 flower sessile; fruit cordate, broader than high, less than 1 line long, papillate-roughened all over; ribs inconspicuous.

Dry mountain slopes of the Coast Ranges and Sierra Nevada; frequent. Apr.-May. A plant of peculiarly irregular inflorescence.

10. CONIUM L.

Tall branching biennial with dissected decompound leaves. Flowers white, in compound umbels. Involucre and involuclcs small. Calyx-teeth obsolete. Fruit broadly ovate, somewhat laterally flattened. Ribs prominent. Oil-tubes none. (Greek konas, to whirl around, dizziness caused by eating leaves.)

1. *C. maculatum* L. POISON HEMLOCK. Tall, 4 to 7 ft. high, the stem dotted with purple marks; herbage with a mouse-like odor; leaves 1 ft. long or more, the segments incised or pinnatifid; rays 10 to 13 or more, less than 1 to $1\frac{1}{4}$ in. long; bractlets ovate-lanceolate, commonly 3; fruit $1\frac{1}{2}$ lines long, shorter than the pedicels.

Naturalized from Europe in shady or moist ground. Widely distributed. Poisonous plant, all parts toxic, although preparations from the leaves are sometimes inert.

11. VELAEA DC.

Subglabrous perennials with thick yellow elongated odoriferous taproots. Leaves mostly radical, pinnately or in ours ternately compound. Ours usually without involucre, the involuclcs in our species of few small lanceolate bracts. Flowers yellow, in compound umbels. Calyx-teeth mostly small. Fruit oblong or orbicular, glabrous or pubescent, somewhat laterally compressed, with prominent equal ribs. Oil-tubes conspicuous, 3 to 6 in the intervals, 4 to 10 on the face. Carpophore undivided. Seed-face strongly involute, enclosing a central cavity. (Sebastin' Eugene Vela, student of the Umbelliferae.)

Leaflets $\frac{1}{2}$ to 1 in. long; bractlets inconspicuous, shorter than the umbellet; fruit 2 lines long or less, with filiform ribs.....1. *V. kelloggii*.
Leaflets 1 to 2 in. long; bractlets conspicuous, some exceeding the umbellet; fruit 3 to 4 lines long, with prominent sharp ribs.....2. *V. hartwegii*.

1. *V. kelloggii* (Gray) C. & R. Erect, minutely scabrous, $\frac{3}{4}$ to $1\frac{3}{4}$ ft. high; flowering stems leafless or with a single leaf $\frac{1}{2}$ to 1 ft. above the base; leaves 1 to 2 or 3 times ternate; leaflets ovate or roundish, sharply serrate, incised, the terminal divisions ternate, or quinate, or divided, mostly $\frac{1}{2}$ to 1 in. long; rays about $1\frac{3}{4}$ in. long, in fruit $3\frac{3}{4}$ in. long or less; pedicels 1 to

2 lines long; bractlets inconspicuous, shorter than the umbellets; fruit 1 to 2 lines long, nearly as broad; ribs filiform; oil-tubes 3 in the dorsal intervals, 5 to 6 in the laterals, 8 to 10 on the face.—(*Deweya kelloggii* Gray.)

Coast Ranges from Petaluma, Bolinas Bay and Mt. Tamalpais to Monterey. Rather rare.

2. *V. hartwegii* (Gray) C. & R. Acaulescent, mostly caespitose, 1 to 3 ft. high; caudex much branched, crowning a stout taproot; scapes and petioles somewhat scabrous; leaves biternately divided, or a portion triternately divided, the ultimate lateral divisions mostly 3-foliolate, the ultimate middle divisions mostly 5-foliolate; leaflets ovate or oblong, sparingly incised, serrate, mucronate, 1 to 2 in. long, or the leaflets often more or less confluent; petioles 2 to 6 in. long; rays about 15, 2 in. long or less; bracts none; bractlets 3 to 6, unequal, linear-lanceolate, long-pointed, exteriorly disposed, mostly surpassing the umbellets; flowering pedicels less than 1 line long; fruit nearly orbicular, smooth, 3 to 4 lines long; ribs filiform; oil-tubes as in the last.—(*Deweya hartwegii* Gray.)

Sierra Nevada; South Coast Ranges (Mt. Diablo and the Oakland Hills to San Luis Obispo). Apr. Somewhat rare locally.

12. *APIUM* L.

Ours erect glabrous biennial with fibrous roots and pinnately divided leaves. Stems tri- or di-chotomously branched, forming a paniculate inflorescence, the compound umbels terminal on the branches and subsessile in the forks. Involucre and involuclers small or none, or the former sometimes foliaceous. Flowers white, in compound umbels. Calyx-teeth obsolete. Fruit elliptic-ovate or broader than long. Ribs prominent, obtuse, equal. Oil-tubes solitary in the intervals, 2 on the face. Seed-face plane. (Old Latin name of Celery.)

1. *A. graveolens* L. COMMON CELERY. Erect, 3 or 4 ft. high; lower leaves long-petioled, leaflets 5 (or 7 or 9), $1\frac{1}{4}$ to 3 in. long and as broad or broader, coarsely toothed and 3-cleft or even -divided; upper leaves on short petioles or sessile, the leaflets 3; rays 4 to 12 lines long; fruit $\frac{1}{2}$ to $\frac{3}{4}$ line long.

An escape from gardens; naturalized in the marshes from Suisun to Monterey. July-Aug.

13. *CICUTA* L. WATER HEMLOCK.

Tall branching glabrous perennials growing in marshes or by stream banks. Rootstocks short and erect, or horizontal and branching. Leaves pinnately or ternately compound. Flowers white, in compound umbels. Calyx-teeth somewhat prominent. Involucre present or none. Involuclers of small bractlets. Fruit oblong to orbicular, glabrous. Ribs corky, broad but low, the lateral in cross section evidently larger than the intermediate and dorsal. Oil-tubes 2 on the face, solitary in the intervals. (Classical name of the Hemlock, which was given to criminals, and sometimes, when the Greeks had a superfluity, to philosophers, as a death-poison.)

Involucre none or of a single bract; fruit 1 to $1\frac{1}{2}$ lines long; hill streams....1. *C. virosa*. Involucre of several to many lanceolate bracts; fruit nearly 2 lines long; salt marshes....

2. *C. bolanderi*.

1. *C. virosa* L. var. *californica* C. & R. CALIFORNIA WATER HEMLOCK. Stems about 3 ft. high; rootstock horizontal, much branched; radical leaves pinnate or partly bipinnate below, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, on long ($\frac{1}{2}$ to $1\frac{1}{2}$ ft.) petioles; leaflets ovate-lanceolate or lanceolate, serrate, 3 to 4 in. long, often deeply 1-lobed on one side towards the base; rays somewhat unequal, $\frac{1}{4}$ to

2¼ in. long; pedicels 2 to 4 lines long; involucre none, or merely 1 narrow bract; bractlets several, ovate, acuminate; fruit 1 to 1¼ lines long with narrow not depressed oil-tubes, those on the face approximate near the median line. —(*C. californica* Gray.)

Margins of streams near the coast: Oakland Hills; San Francisco; Santa Cruz; Monterey. July-Aug.

2. *C. bolanderi* Wats. Stem 5 to 10 ft. high, branched above, with nearly or quite vertical rootstock and large radical and cauline bipinnate leaves 2 ft. long or less; leaflets lanceolate, serrate, 2 in. long; bracts and bractlets lanceolate, the former often scarious-margined; rays 1½ in. long, subequal, pedicels 2 lines long; fruit orbicular, 2 lines long, prominently ribbed, the quite mature carpels rather strongly concave on the face, thus appearing somewhat lunate; oil-tubes broad, depressed in the channeled seed.

Suisun Marshes, abundant and conspicuous. Sept.-Oct. Reputed poisonous to cattle.

14. AMMI L.

Erect branching glabrous biennial with slightly fusiform roots and dissected decompound leaves. Flowers white in compound umbels. Bracts parted into filiform segments. Bractlets lanceolate, acuminate. Flowers white, in a terminal compound umbel with long rays and short pedicels. Calyx-teeth obsolete. Fruit ovoid, very slightly flattened laterally. Ribs filiform. Oil-tubes solitary in the intervals and 2 on the face. (Greek name of an umbelliferous plant.)

1. *A. majus* L. BISHOP'S WEED. Stem slender, branching above, 1¼ to 2½ ft. high; leaves tritermately dissected into small spatulate segments (2 to 6 lines long), which are lacinate or serrulate at apex; rays about 25 to 30, little unequal, ¾ to 2 in. long; pedicels 1 to 1½ lines long; bracts linear below, parted above into 3 filiform divisions; bractlets lanceolate, acuminate, entire, scarious-margined at base; fruit less than 1 line long; carpels with concave face; oil-tubes solitary in the intervals, 2 on the face.

Low places in grain fields at Yountville and in marshes at Alvarado.

15. CARUM L.

Ours erect and slender glabrous biennials or perennials. Leaves simply pinnate with few linear entire leaflets. Flowers white, in compound umbels. Involucre of entire bracts or none. Involucels of entire bractlets. Calyx-teeth small. Stylopodium conical. Fruit ovate or oblong, laterally compressed, with obtuse ribs. Oil-tubes solitary in the intervals, 2 on the face. (Karon, Greek name of the Caraway.)

Stems clustered, from a fascicle of coarse roots; fruit 2 to 3 lines long...1. *C. kelloggii*. Stem solitary, from a tuber or cluster of tubers; fruit about 1 line long...2. *C. gairdneri*.

1. *C. kelloggii* Gray. Stems several from a fascicle of coarse and hard fibrous roots, 3 to 5 ft. high; radical leaves 5 to 10 in. long, ternate, each division pinnate with narrowly linear divisions 3 or 4 in. long; cauline leaves similar but smaller; involucre bracts and involucel bractlets several, lanceolate or subulate; rays ¾ to 1½ in. long; stylopodium very large, with short stout styles; carpels frequently unequal or only one maturing.

Very common in the open hill country about San Francisco Bay: Vacaville; Napa Range; Oakland Hills. Sometimes called "Wild Anise."

2. *C. gairdneri* (H. & A.) Gray. SQUAW-ROOT. Stem solitary, 14 to 21 in. high, from a tuberous root or a fascicle of such; leaves few, simply pinnate, with 3 to 7 linear leaflets 2 to 6 in. long; upper leaves mostly simple; rays

3 to 6 lines long; involuere of several bracts or none; involucels of linear acuminate bractlets; stylopodium low, with long slender styles.

Napa Range, Ukiah and northward to British Columbia. The tubers and the young shoots were used as food by the Pomos, in both cases being eaten raw.

16. EULOPHUS Nutt.

Glabrous perennials with deep-seated fascicled tubers and radical leaves or the cauline few and small. Leaves compound with the leaflets or ultimate segments linear or elongated and entire, rarely ovate or oblong and incised; terminal leaflet elongated, always entire and often caudate. Flowers white or pinkish. Umbels long-peduncled. Bracts of involuere and bractlets of involucel similar, several, lanceolate, acuminate. Calyx-teeth prominent. Fruit ovate to linear-oblong, glabrous, flattened laterally. Ribs filiform, equal. Stylopodium conical, with long strongly recurved or deflexed styles. Oil-tubes 1 to 5 in the intervals, 4 to 8 on the face. Seed-face broadly concave, with a central longitudinal ridge. (Greek eu, true, and lophus, crest, in reference to the salient terminal leaflet.)

1. *E. californicus* (Torr.) C. & R. Stems generally 3, erect, 3 to 5 ft. high; leaves radical, pinnately twice compound; leaflets ovate, pinnately incised, 5 to 7 lines long, or the leaflets of the earliest leaves linear, 3 to 5 or more lines long; terminal leaflet $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, $1\frac{1}{2}$ lines wide, entire; rays 1 to $1\frac{3}{4}$ in. long; flowers white; fruit linear-oblong, 3 lines long; oil-tubes large and solitary in the intervals, 4 on the face.—(*Podosciadium californicum* Gray.)

Along stream, Aurora Honda, at foot of Mt. Day (Mt. Hamilton Range), Dr. R. J. Smith; Sierra Nevada foothills from Knights Ferry to Mariposa Co.

17. PIMPINELLA L.

Glabrous perennials with decompound leaves. Flowers white or pinkish in ours, in compound umbels. Involuere and involucels none. Calyx-teeth obsolete. Fruit ovate, with a broad commissure. Ribs slender, equal, distant. Oil-tubes numerous, 2 to 6 in the intervals, several on the face. (Connected with Latin *pampinus*, a tendril, the application not obvious.)

1. *P. apiodora* Gray. PIMPINEL. Erect, 2 or 3 ft. high; leaves mostly radical, 2 or 3 times ternate; leaflets ovate in outline, laciniately pinnatifid and serrate, 1 to $1\frac{1}{3}$ in. long; umbels long-peduncled; rays 14 to 20, 1 to 2 in. long; fruit broadly ovate, $1\frac{1}{2}$ lines long; oil-tubes 4 or 5 in the dorsal intervals, about 6 in each lateral, 8 or more on the face.—(*Ligusticum apiodorum* C. & R.)

Rocky or bushy hills, San Francisco, Pt. Reyes and northward to Mendocino Co. June.

18. SIUM L. WATER PARSNIP.

Glabrous perennial marsh or aquatic herbs. Culine leaves simply pinnate. Flowers white, in compound umbels. Bracts and bractlets several to many. Calyx-teeth minute. Styles short. Stylopodium depressed. Fruit ovate or oblong, somewhat laterally compressed, with narrow commissure. Ribs prominent, corky. Oil-tubes 2 or 3 in the intervals, at least in some of the intervals. (Sion, Greek name of some water plant.)

1. *S. cicutaeifolium* Gmel. var. *heterophyllum* Jepson. Stem stout, $2\frac{1}{2}$ to $3\frac{1}{2}$ ft. high, from a cluster of fleshy fibrous roots, angular and more or less flexuous; lowest leaves sometimes simple, on long fistulous petioles, serrate

or laciniate, or pinnate like the cauline, $3\frac{1}{2}$ ft. long or less; leaflets 5 to 13, broadly lanceolate, serrate, 3 to 4 in. long; bracts lanceolate, over $\frac{1}{2}$ in. long, scarious-margined below; bractlets ovate-lanceolate, $1\frac{1}{2}$ lines long; fruit ovoid, 2 lines long, with acute ribs; oil-tubes 2 on the face, 2 or 3 in the intervals or occasionally 1.

Salt-marshes: Suisun Marshes; Stockton.

19. LILAEOPSIS Greene.

Small glabrous perennials. Stems fistulous, creeping and rooting in the mud, only the leaves and short peduncles erect. Leaves reduced to hollow cylindrical petioles jointed by transverse partitions. Flowers dull white or slightly tinged with pinkish brown, in a few-flowered umbel. Bracts of the involucre minute. Fruit subglobose. Dorsal ribs filiform, the lateral corky and thickened next to the commissure. Oil-tubes solitary in the intervals, 2 on the face. (Named for its resemblance to *Lilaea*.)

1. *L. lineata* (Michx.) Greene. Leaves 1 to 8 in. long, 1 to 2 lines wide; peduncles 1 in. long or less; fruiting pedicels $1\frac{1}{2}$ to 3 lines long; petals plane; fruit 1 line long.—(*Crantzia lineata* Nutt.)

Salt marshes or brackish mud flats: Bodega Head; Pt. Reyes; Port Costa to Antioch; Roberts Island.

20. OENANTHE L.

Aquatic glabrous herbs with succulent stems from thick rootstocks. Leaves pinnately compound. Flowers white in compound umbels, terminating the branches. Involucre present or none. Involucels present. Calyx-teeth rather prominent. Styles slender, at length elongated. Fruit globose-ovate, cylindric or slightly flattened laterally. Ribs broad, obtuse, corky; commissural face also corky. Oil-tubes solitary in the intervals, 2 on the face, the seed furrowed beneath them. (Ancient Greek name of some thorny plant.)

1. *O. sarmentosa* Presl. Stems succulent, 2 to 4 ft. high; leaves ternate and bipinnate; leaflets 5 to 13, 6 in. long or less, ovate-lanceolate, the lower obliquely lobed on the lower side or with an almost distinct supplementary leaflet; rays $\frac{3}{4}$ to 2 in. long; bracts few or none; bractlets lanceolate, acuminate; fruit 1 to 2 lines long, the ribs very corky and somewhat turgid.

Mendocino Co. and Sierra Nevada north to British Columbia. Var. *CALIFORNICA* C. & R. Erect, 2 to 4 ft. high; leaves bipinnate; leaflets elliptic-ovate in outline, 3-cleft or -parted and also coarsely toothed or incised, those of the upper leaves crowded on the rachis and sometimes tending to be conduplicate; fruit cylindric, 2 lines long, crowded.—Slow streams or shallow ponds, often filling them with dense masses; San Francisco Bay region to Southern California. In autumn the stems may give rise to slender runner-like branches 3 to 5 ft. long which produce at intervals bulblets $\frac{1}{2}$ in. in diameter or less. (*O. californica* Wats.)

21. BERULA Hoffm.

Glabrous marsh perennial with pinnate leaves and serrate leaflets. Flowers white, in terminal compound umbels. Bracts narrow. Bractlets unequal, 1 or 2 surpassing the flowers. Fruit subglobose, glabrous, surrounded by a continuous corky covering of confluent ribs. Oil-tubes numerous and contiguous, in the mature fruit more or less confluent, closely surrounding the seed cavity. (Latin name of the Water-cress.)

1. *B. erecta* (Huds.) Coville. Erect, rather stout, corymbosely branching above, 6 in. to 3 ft. high; leaves simply pinnate; leaflets 9 to 19, 1 or

2 in. long, ovate to linear, serrate or laciniately lobed; umbels many-rayed; rays $\frac{1}{2}$ to 2 in. long in fruit; pedicels 2 to 3 lines long; fruit less than 1 line long.—(*Berula angustifolia*, Bot. Cal.)

Widely distributed from Southern California north to Oregon and east to Illinois. San Mateo, acc. Greene.

22. FOENICULUM Hill.

Stout glabrous perennial with dark green aromatic herbage. Leaves decom-pound, dissected into numerous filiform segments. Flowers yellow, in large compound umbels. Involucre and involucels none. Calyx-teeth obsolete. Fruit oblong. Ribs prominent. Oil-tubes solitary in the intervals, 2 on the face. (Diminutive of Latin *foenum*, hay, from its odor.)

1. **F. vulgare** Gaertn. SWEET FENNEL. Glaucous; stem striate, branch-ing, 3 to 7 ft. high; rays $\frac{1}{2}$ to $2\frac{1}{2}$ in. long; fruit 2 lines long.

Waste places on old farms and by country lanes, flowering in summer: Lake Co.; Solano Co.; Napa Valley; Berkeley, etc. A nuisance in vacant lots at San Luis Obispo (Judge E. P. Unagast).

23. SELINUM L.

Tall branching perennials with pinnately decom-pound leaves. Flowers white, in compound umbels. Involucre of few bracts. Involucels of many bractlets. Calyx-teeth obsolete. Fruit oblong to obovate, flattened dorsally, glabrous or pubescent, with rather prominent disk. Ribs winged, the lateral usually broadest. Oil-tubes solitary in the intervals, 2 to 4 on the face. (*Selinon*, Greek name of the Parsley.)

1. **S. pacificum** Wats. Leaves ternate and bipinnate, the ovate acutish segments 1 in. long and laciniately toothed and lobed; umbels on stout ped-uncles, about 15-rayed; involucre conspicuous, its bracts 2 or 3, lobed and toothed, 1 in. long and equaling the rays; involucels of several narrowly linear entire or 3-toothed bractlets, equaling the flowers; pedicels slender; fruit smooth, oblong, 3 or 4 lines long; wings thin, rather narrow; stylopodium slightly prominent above the disk; oil-tubes conspicuous, very rarely in pairs, the dorsal ones sunk in the body of the seed.

Long attributed to Marin Co., but probably by error, since not found in thirty years. Doubtless belongs to the Mt. Shasta region (Alice Eastwood).

24. ANGELICA L.

Stout perennials with ternately or pinnately compound leaves. Flowers white in large terminal compound umbels. Involucre scanty or none. Involucels of small bractlets or none. Calyx-teeth mostly obsolete. Fruit strongly com-pressed, elliptic-oblong in outline. Ribs prominent, the lateral broadly winged, the others often narrowly winged. Oil-tubes 1 to 3 in the intervals, 2 to 4 on the face. (Latin *angelica*, on account of its medicinal properties.)

Rays equal, in flower 1 to $1\frac{1}{2}$ in. long; bractlets many, linear-acuminate. . . 1. *A. hendersonii*.
Rays unequal, in flower 1 to 4 or 6 in. long; bractlets none, or few and setaceous.

2. *A. tomentosa*.

1. **A. hendersonii** C. & R. Very stout, densely tomentose, especially on the inflorescence and whitened under surface of the leaves; leaves quinate, then pinnate; leaflets thick, broadly ovate, 3 to 4 in. long, obtuse, serrate; umbels rather condensed; rays in flower equal, about $1\frac{1}{4}$ in. long; pedicels 1 line long or less; bractlets many, linear-acuminate; fruit broadly oblong, slightly pubes-

cent, 3 to 4 lines long; lateral wings thick and corky, as broad as the body; seed deeply sulcate beneath the oil-tubes.

San Francisco and northward along the coast to Washington. The Californian plants (at least) are too close to the next.

2. **A. tomentosa** Wats. Stout, 2 to 5 ft. high, the stems and especially the leaves finely tomentose, roughish-pubescent, or nearly glabrous; leaves ternate, then pinnate; leaflets 2 to 3 in. long, ovate or almost round, 3-lobed or obliquely 2-lobed, or not lobed and merely oblique, irregularly serrate; petioles very much dilated at base; rays 1 to 6 in. long; pedicels 2 or 3 lines long; fruit oblong or elliptical, glabrous, 3 to 4½ lines long; dorsal and intermediate ribs small and acutish; lateral wings nearly equaling the body in breadth; oil-tubes 2 on the face; seed somewhat sulcate beneath the oil-tubes.

Along the coast, San Francisco north to Mendocino and south to San Diego. Var. **ELATA** Jepson. Five to 8 ft. high; radical leaves as much as 4 ft. long; leaflets ovate-lanceolate or lanceolate, grayish puberulent, 4 to 6 in. long.—Common in the cañons and mountains about Napa Valley. Var. **CALIFORNICA** Jepson. Roughish puberulent on the leaves and ends of the rays, the stem glabrous; leaves biternate or quinate, then once pinnate or partially bipinnate; leaflets ovate, 2 in. long, the terminal mostly 3-lobed at summit, the lower often lobed or divided at base, all irregularly serrate with the serratures mucronulate; rays unequal, 1 to 6 in. long; pedicels subequal, 3 lines long; dorsal and intermediate ribs often winged; oil-tubes 2 or 3 in the intervals, 2 on the face.—Vaca Mts. May-June. Fr. July-Aug.

25. LEPTOTAENIA Nutt.

Tall stoutish glabrous perennials, with thick fusiform roots and pinnately compound leaves. Flowers yellow or purple, in compound umbels. Involucre of few bracts or none. Involucels of small and numerous bractlets or none. Fruit oblong to suborbicular, strongly compressed. Lateral ribs with broad corky-thickened wings coherent until maturity. Dorsal and intermediate ribs filiform and approximate. Oil-tubes 1 to 8 in the intervals, 2 to 10 on the face. (Greek leptos, narrow, and tainia, vittae or oil-tubes.)

Involucels none; oil-tubes present.....1. *L. californica*.
Involucels present; oil-tubes none.....2. *L. dissecta*.

1. **L. californica** Nutt. Erect, 2 or 3 ft. high, glaucous; leaves once or twice ternate, then pinnate; leaflets 1 in. long or more, cuneate-orbicular or -obovate, 3-lobed or the terminal 3-parted, serrate above; peduncles at summit abruptly widened into a disk-like dilatation; rays subequal, 2 to 3 in. long; pedicels 1½ to 3 lines long; fruit elliptical, narrowly winged, 4 lines long; oil-tubes 6 to 10 on the face (the lateral frequently anastomosing), 3 or 4 in the intervals.

North Coast ranges from the Napa Range to Klamath River (western Siskiyou Co.) Mar.-Apr. Var. **PLATYCARPA** Jepson. Four ft. high; fruit more broadly winged, 7 lines long.—Vaca Mts.; Napa Co.

2. **L. dissecta** Nutt. Stems many from a thick root, leafy at base; leaves broad, 2 or 3 times ternate and then once or twice pinnate, the segments incised-pinnatifid; peduncles 1 to 2 ft. long; rays 2 to 5 in. long; involucre of few bracts or none; involucels of several lanceolate bractlets; flowers yellow or purplish; fruit oblong, 5 to 9 lines long; oil-tubes none or very obscure.

Mendocino and Lake cos.; Sierra Nevada. Apr.-June.

26. PEUCEDANUM L.

Low perennials, mostly of dry ground, with thick roots. Stems usually several from the root crown, naked or few-leaved. Leaves decomposed, often dissected, mostly wholly radical. Flowers white or yellow, rarely purple, in compound umbels. Involucre none (a few species sometimes with 1 to 3 bracts). Involucels usually present. Fruit roundish to broadly or narrowly oblong, much compressed. Lateral ribs winged, the wings of the companion carpels coherent until maturity. Stylopodium wanting. Oil-tubes 1 to 4 in the intervals, 2 to 6 on the face. (The ancient Greek name.)—The American representatives of the genus are considered by some authors as generically distinct from the typical European *Peucedanums* and have been referred to *Lomatium* Raf. and more recently renamed under the name *COGSWELLIA* Spreng.

A. Peduncles and pedicels conspicuously swollen at summit.

Flowers yellow; bractlets none; fruit glabrous.....1. *P. nudicaule*.

B. Peduncles and pedicels not swollen at summit.

Leaves ternate and pinnate, with broad leaflets.

Leaflets ovate in outline, serrate and more or less incised; fruit 3 to 3½ lines long....

2. *P. parvifolium*.

Leaflets roundish, serrate, often 3-lobed but the lobes broad; fruit 6 to 8 lines long, nearly or quite as broad.....3. *P. hassei*.

Leaves decomposed and much dissected into small linear or filiform segments.

Flowers white; bractlets more or less united into a 1-sided involucrel.

Fruit glabrous; oil-tubes solitary in the intervals.....4. *P. macrocarpum*.

Fruit tomentose or pubescent; oil-tubes 2 or 3 in the intervals, rarely solitary.....

5. *P. dasycarpum*.

Flowers yellow; bractlets distinct.

Oil-tubes solitary in the intervals.

Bract 1 or none; body of fruit on a distinct stipe, the stipe and body with a wing twice as broad as body.....6. *P. vaseyi*.

Bracts 1 to 3; bractlets scarious-margined; wing of fruit scarcely as wide as body....

7. *P. utriculatum*.

Oil-tubes none in the intervals or indistinct; wing ½ to almost as wide as body; bracts none.....8. *P. caruifolium*.

1. ***P. nudicaule*** (Pursh) Nutt. PESTLE PARSNIP. Acaulescent, 6 to 16 in. high, glabrous, with thick taproot; leaves 3 to 6 in. long, simply ternate or mostly once or twice ternate and then pinnate with 5 to 21 leaflets; leaflets broadly lanceolate to ovate, entire or few-toothed at apex, ¾ to 2 in. long, petiolulate or the lateral leaflets in decomposed leaves mostly sessile; peduncles stoutish, conspicuously enlarged at the summit and bearing 6 to 18 very unequal rays, the outer sometimes 2 to 3 times the length of the inner; rays in fruit dilated at apex, 2 to 10 in. long; fruiting pedicels 1 to 3 lines long; bracts and bractlets none; flowers yellow, in capitate umbellets; fruit elliptic-oblong, 4 to 5 lines long, 2½ to 3 lines wide, the wings one-half the breadth of the body; oil-tubes broad, solitary in the dorsal intervals, 1 or 2 in the laterals, 4 or 6 on the face.—(*P. leiocarpum* Nutt.)

Low open foothills, North Coast Ranges (Sonoma, Napa and Solano cos.) and Sierra Nevada (Irishtown, Amador Co.) northward to the Columbia River. Also Mt. Hamilton, acc. Coulter and Rose. The northern plants have narrower leaves and more slender peduncles.

2. ***P. parvifolium*** T. & G. Acaulescent or very short-caulescent, 6 to 10 in. high, glabrous; leaves 3 or 4 in. long, ternate, then pinnately divided into 3 or 5 leaflets, or the upper leaflets confluent; leaflets ovate, mostly cuneate at base, 2 or 3-cleft, incised or serrate, the teeth strongly cuspidate, ½ to 1½ in. long; peduncles 1 to 3; rays about 10, unequal, ½ to 2 in. long; pedicels 3 to 4½ lines long; bractlets subulate; flowers deep yellow; fruit broadly elliptical

to orbicular, 3 to $3\frac{1}{2}$ lines long, the wings broader than the body; oil-tubes solitary in the intervals, 2 to 4 on the face.

Santa Cruz Mts.; Monterey; San Luis Obispo. May.

3. *P. hassei* C. & R. Nearly acaulescent, 16 in. high, glabrous and glaucous; leaves ternate and pinnate; leaflets roundish, cuspidately serrate, frequently 3-lobed, $\frac{1}{2}$ to $1\frac{1}{2}$ in. broad; peduncles several; rays 11 to 18; bractlets ovate or lanceolate, or mostly one and that laciniately cleft; fruit 6 to 8 lines long, nearly or quite as broad, very broadly winged, emarginate at base and apex; oil-tubes 4 on the face, solitary in the intervals with occasionally an additional one in one of the lateral intervals.

Mt. Hood Range; Vaca Mts.; Southern California.

4. *P. macrocarpum* Nutt. Short-caulescent, 10 to 14 or 16 in. high, the stems several from a short scale-bearing caudex crowning an elongated tuberous root; herbage thinly short-pubescent; leaves in a basal or sub-basal tuft, 2 to 5 in. long, or the earliest as much as 10 in. long, once or twice ternate and twice pinnately divided, the segments linear, acute, $\frac{1}{2}$ line broad or less and $\frac{1}{2}$ to 2 lines long, the ultimate divisions of the rachis winged; fruiting rays about equal, $1\frac{1}{2}$ to 4 in. long; pedicels 3 to 5 lines long; bracts none; involucre of many lanceolate bractlets mostly exceeding the umbellets, sometimes united at base and unilateral; flowers chalk-color; ovary and fruit glabrous; fruit oblong to ovate, mostly narrow but sometimes very broad and somewhat quadrangular, 2 to 4 lines wide, 6 to 10 lines long; ribs inconspicuous or almost obsolete; oil-tubes 1 to each interval, 2 to 6 on the face, the seed sharply channeled beneath those of the dorsal intervals; wings broader, sometimes narrower than body.

Open stony hills in the Coast Ranges and Sierra Nevada. Not uncommon with us but more abundant and widely distributed northward to the Columbia River.

5. *P. dasycarpum* T. & G. Nearly acaulescent, the peduncles several from a stout taproot, erect or ascending, 6 to 15 in. high; herbage with a short stiffish pubescence; leaves ternately decompose and dissected into small narrowly linear segments; segments 1 or 2 lines long and less than $\frac{1}{2}$ line wide; fertile rays 6 to 11, 1 to $2\frac{1}{2}$ in. long; pedicels in fruit 3 to 6 lines long; involucre unilateral, composed of several ovate or lanceolate more or less united bractlets; ovary tomentose or conspicuously woolly; fruit suborbicular, 4 or 5 lines long and nearly or quite as broad; wings quite as broad or broader than body; oil-tubes variable, 2 or 3 in the intervals or sometimes 1, 4 or 2 on the face.

Open chaparral hills or open woods, or in the valleys of the Coast Ranges and Sierra Nevada foothills, common but rarely abundant in any one place. No satisfactory differences between this species and *P. tomentosum* Benth. have yet been formulated and perhaps do not exist. The number of oil-tubes is very variable, the segmentation of the leaves equally so, while the tomentum of the fruit is singularly inconstant. Apr.-May.

6. *P. vaseyi* C. & R. Short-caulescent, branching near the base, 1 ft. high; leaves ternate-pinnate, the divisions pinnately cut into segments 1 to 2 lines long and $\frac{1}{4}$ to $\frac{1}{2}$ line broad; petioles broadly inflated, 4 to 5 lines long; rays 5 to 14, the fertile $\frac{1}{2}$ to $2\frac{1}{4}$ in. long; involucre none; pedicels 1 to 2 lines long; bractlets cuneate-obovate, abruptly acuminate; flowers yellow; fruit elliptic or slightly narrowed towards the base, 4 to $5\frac{1}{2}$ lines long, 3 to 4 lines wide; the body 2 to $2\frac{1}{2}$ lines long, contracted at base into a stipe-like process

1½ lines long and at apex into a beak-like process 1 line long, the whole with broad wings, broader than body; dorsal and intermediate ribs obvious, with broad solitary oil-tubes in the intervals, 4 on the face.

San Bernardino Mts., *Vasey*, northward to the Mt. St. Helena Range and eastward to Inyo Co.

7. **P. utriculatum** Nutt. **BLADDER PARSNIP.** Caulescent, or even sometimes acaulescent, with many stems and leaves from a thick taproot, forming a bushy tuft 4 to 12 in. high; leaves 2 to 8 in. long, ternate-pinnately decompound and dissected into linear segments $\frac{1}{4}$ to $\frac{1}{2}$ line broad and 1 to 3 lines long; petioles conspicuously inflated, membranous, $2\frac{1}{2}$ to 7 lines broad; rays 3 to 15, very unequal, the fruiting ones $\frac{1}{2}$ to 3 in. long; pedicels 2 to 4 lines long; involucre none or occasionally with 1 often foliaceous bract; bractlets few, round-obovate to oblong, 1 to 2 lines broad, shortly petiolate, equaling the yellow flowers; fruit narrowly elliptic, $1\frac{1}{2}$ to $3\frac{1}{2}$ lines broad, $2\frac{1}{2}$ to $4\frac{1}{2}$ lines long; wings as broad as or narrower than body; oil-tubes 4 to 6 on the face, 1 in each interval or with short accessory ones in the dorsal intervals.

Open grassy hills or plains, the most common species, frequent from Southern California northward through the Coast Ranges and Sierra Nevada foothills to Oregon and British Columbia. Bractlets variable in shape, entire, toothed or lacinate, usually acuminate, often longer than flowers.

8. **P. caruifolium** T. & G. **ALKALI PARSNIP.** Nearly or quite acaulescent; peduncles 3 or 4 from a common stout taproot, 8 to 14 in. high; herbage nearly or quite glabrous; leaves ternately decompound, dissected into linear segments $\frac{1}{4}$ to 1 line wide and 1 to 5 lines long; fertile rays 6 to 11, 1 to $1\frac{1}{2}$ in. long; pedicels in fruit $1\frac{1}{2}$ to $3\frac{1}{2}$ lines long; involucre none; bractlets distinct or nearly distinct, round-ovate or oblong, scarious-margined, entire, ciliate, or toothed at apex, often shortly petiolate; fruit glabrous, suborbicular or elliptic, 3 to 5 lines long, the wings $\frac{1}{2}$ to almost as wide as body; oil-tubes none on the face, none in the intervals or indistinct.

Low wet ground, frequent: Sacramento and San Joaquin valleys and South Coast Ranges.

27. PASTINACA L.

Tall branching biennial with angular or fluted leafy stems from thick roots. Leaves large, pinnate. Flowers yellow, in compound umbels. Involucre and involucls small or commonly none. Fruit oval, glabrous, strongly compressed. Lateral ribs winged; dorsal and intermediate ribs filiform. Oil-tubes solitary in the intervals, 2 to 4 on the face. (Latin name of the Parsnip.)

1. **P. sativa** L. **COMMON PARSNIP.** Erect, 3 or 4 ft. high; leaflets ovate, serrate, somewhat incised or even widely 3-lobed, 3 or 4 in. long; rays 15 to 20, 1 to $2\frac{1}{2}$ in. long; fruit nearly orbicular, $2\frac{1}{2}$ to 3 lines long; oil-tubes conspicuous.

Escaped from gardens: Lake Co.; Sacramento.

28. HERACLEUM L.

Tall stout perennials with very large ternately compound leaves and broad sheathing petioles. Flowers white, in a large many-rayed umbel. Involucre deciduous. Involucels of numerous bractlets. Petals obovate, the marginal ones of the umbel much larger. Fruit almost round, strongly compressed. Lateral ribs with a thin wing; dorsal and intermediate ribs filiform. Oil-tubes 2 on the face, 1 in each interval, visible from the outside and reaching from

the summit to about the middle of the carpels. (Named for Hercules, who, it is said, first used it in medicine.)

1. *H. lanatum* Michx. COW PARSNIP. Four or 5 ft. high; leaflets 3, petiolulate, ovate or orbicular, sharply serrate and lobed, 3 to 6 in. broad; umbels 6 to 10 in. broad; fruit $3\frac{1}{2}$ to 5 lines long.

Common in brushy cañons or on north slopes: Coast Ranges near the sea and at middle altitudes in the Sierra Nevada. Reputed poisonous to cattle.

GARRYACEAE. SILK TASSEL FAMILY.

Shrubs or small trees with quadrangular branchlets. Leaves simple, opposite, with short petioles. Flowers dioecious, apetalous, borne along a pendulous catkin-like axis, 1 (in case of the pistillate) or a cyme of 3 (in case of the staminate) in the axil of each of the decussately connate bracts. Staminate flower:—calyx 4-parted into linear valvate sepals; stamens 4; filaments distinct. Pistillate flower:—calyx with a shortly 2-lobed or obsolete limb; ovary inferior, 1-celled, with 2 pendulous ovules; styles 2, stigmatic on the inner side, persistent. Fruit a berry; epicarp at maturity dry and brittle, free from the pulpy portion and dehiscing irregularly, or sometimes circumscissile. Seeds with thin testa and horny endosperm, the minute embryo at one end.

1. GARRYA Dougl.

The only genus. (Nicholas Garry, of the Hudson Bay Co., the friend of David Douglas, the botanical explorer of Pacific North America, 1825-1832.)

Leaves undulate-margined; fruit tomentose.....1. *G. elliptica*.
Leaves plane, often yellow-green; fruit at maturity glabrous.....2. *G. fremontii*.

1. *G. elliptica* Dougl. SILK TASSEL BUSH. Commonly a shrub 5 to 8, or rarely a small tree up to 20 ft. high; leaves elliptical or narrower, the margin undulate and more or less revolute, glabrous above, tomentose beneath; catkins solitary or clustered, the staminate 4 to 10 in. long, with truncate or acute silky bracts and the calyx-segments cohering at tip, the pistillate shorter, 2 to 4 in. long, with acute or acuminate bracts; ovary sessile; fruit globose, 3 to 4 lines in diameter, densely silky-tomentose like the ovary, in extreme age glabrate; seed oval, 2 lines long.

Common in the Coast Ranges, especially the seaward ranges, from Monterey Co. northward. Feb. Foliage suggestive of *Quercus agrifolia*.

2. *G. fremontii* Torr. BEAR BRUSH. Shrub, 5 to 7 (or 10) ft. high; leaves oblong, tapering to each end, varying to elliptical, glabrous and shining above, gray-puberulent or white-tomentose beneath, in age often glabrous and yellow, particularly on the under surface, not undulate, $1\frac{1}{2}$ (rarely 3) in. long, on petioles 6 lines long; catkins solitary or in clusters of 2 to 6, with acute somewhat silky bracts; staminate catkin 2 to 3 in. long; pistillate catkin about $1\frac{1}{2}$ in. long, the ovary and young fruit very silky; fruiting catkin $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long; mature fruit glabrous, 3 lines long, short-pedicel; seeds subglobose or oval, $1\frac{1}{2}$ lines long.

High Coast Range ridges and slopes, mostly in the inner ranges and a member of the chaparral. Also in the Sierra Nevada. Feb.

G. BUXIFOLIA Gray, of Red Mt., Mendocino Co., has leaves appressed-silky beneath and bears very slender catkins.

CORNACEAE. DOGWOOD FAMILY.

Deciduous trees or shrubs, or some species low and merely suffrutescent. Leaves opposite, simple, entire. Flowers perfect, regular, in cymes or heads.

Calyx-tube coherent with the ovary, its limb represented by 4 small teeth at the summit or none. Petals 4, epigynous, valvate in bud. Stamens 4, alternate with the petals. Ovary 2-celled with a single pendulous ovule in each cell; style filiform; stigma simple. Fruit a drupe, the stone 2-celled with 1 seed in each cell. Embryo minute.

1. CORNUS L. CORNEL. DOGWOOD.

Flowers greenish or white. (Latin cornu, a horn, on account of the hardness of the wood.)

Flowers sessile in a head-like cluster with an involucre of 4 to 6 large white petal-like bracts; drupe scarlet 1. *C. nuttallii*.

Flowers in cymes, inconspicuous; involucre none.

Leaves lighter colored beneath; drupe white; stone conspicuously channeled on the edges 2. *C. pubescens*.

Leaves green, alike on both faces, nearly glabrous.

Stone smooth or somewhat channeled on the edges, not ribbed; drupe whitish or bluish 3. *C. glabrata*.

Stone channeled on the edges and with 8 filiform longitudinal ribs; drupe blue.... 4. *C. costulata*.

1. *C. nuttallii* And. PACIFIC DOGWOOD. Small tree 10 to 30 ft. high; leaves narrow- or elliptic-obovate or even orbicular, with rounded or shortly acute apex 3 to 5 in. long, on petioles 2 to 3 lines long; flowers crowded in a head on a thick convex receptacle and surrounded by a conspicuous petal-like involucre; bracts of the involucre commonly 6, white, sometimes tinged with red, obovate to oblong, $1\frac{1}{2}$ to 3 in. long, abruptly acute or acuminate; heads $\frac{1}{2}$ to 1 in. broad, very dense, borne on peduncles 1 to $1\frac{1}{4}$ in. long; drupe 5 to 6 lines long, scarlet.

Marin Co. (*Erythea*, vi, 73), and the Napa Range northward to Mt. Shasta, thence southward in the Sierra Nevada; rare in the South Coast Ranges (Monterey Co., Santa Cruz Mts.); San Diego Co. Inflorescence remarkably beautiful, appearing with or before the leaves. Also called Nuttall's Dogwood and Mountain Dogwood.

C. CANADENSIS L. Bunch-berry. Herb-like; stem 3 to 6 in. high with a whorl of 6 leaves at summit, a pair of leaves above the middle, and scales below; involucre petal-like.—Mendocino Co. and northward. *C. SESSILIS* Torr. Shrub 10 ft. high or more, with yellowish flowers in sessile umbels subtended by 4 small caducous bracts.—Northern Sierra Nevada west to Trinity River.

2. *C. pubescens* Nutt. var. *californica* C. & E. CREEK DOGWOOD. Shrub 5 to 15 ft. high with smooth purplish branches and branchlets; leaves commonly ovate, varying to elliptical, acute, lighter colored and more pubescent, also conspicuously ribbed, beneath, 2 to 4 in. long; cymes $1\frac{1}{2}$ to 2 in. broad; petals oblong, acute, 2 lines long; style glabrous, little or not at all thickened at apex; drupe white, subglobose, 3 lines in diameter; stone mostly oblique, somewhat flattened, with furrowed edges, each side with 4 less obvious or shallower channels.—(*C. californica* C. A. Mey.)

Common on cañon stream banks in the Coast Ranges and Sierra Nevada, and along the Sacramento and San Joaquin rivers. Flowering and fruiting from Apr. until Nov. Sterile shoots observed in forest shade at Olema bore leaves to 7 in. long and 5 in. broad.

3. *C. glabrata* Benth. Shrub 5 to 12 ft. high, with nearly or quite glabrous twigs; leaves ovate or oblong, acute at each end or often shortly pointed at apex, $1\frac{1}{4}$ to 2 in. long, green on both faces, obscurely pubescent with short scattered appressed hairs; petioles 3 lines long or less; flowers dull white, many in small cymes; ovary canescent; style slightly pubescent; drupe globose, the

flesh whitish or bluish; stone little compressed and not at all or obscurely furrowed.—(*C. torreyi* Jepson, 1st ed., perhaps not Wats.)

South Coast Ranges from Monterey to San Mateo Co. and Mt. Diablo, in stream beds or borders of swamps; North Coast Ranges from Green and Wooden valleys north to Pope Valley, Scott Valley and Mendocino Co., abundant and often forming thickets along the bases of low hills. June.

C. GREENEI C. & E. Leaves similar but rounder; style greenish at the thickened apex; drupe said to be blue; stone globose, not channeled or scarcely ridged.—Lost species; perhaps a form of the last.

C. TORREYI Wats. Shrub; leaves obovate or oblanceolate, abruptly acute or shortly acuminate, on rather long slender petioles, lighter colored and somewhat pubescent beneath with loose silky hairs; cyme loose and spreading; drupe white; stone obovoid, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, somewhat compressed, ridged on the edges, tubercled at summit.—Central California, *Torrey*, exact locality not known. A lost or dubious species.

4. *C. costulata* Jepson, n. sp. Shrub; leaves broadly obovate, often abruptly acute, or much narrower and tapering acutely to both ends, green on both faces and sparingly pubescent with short appressed hairs, 2 to $2\frac{3}{4}$ in. long; flowers 20 to 30 in a cyme, otherwise unknown; fruit blue, nearly globose, 2 to 3 lines long; stone slightly broader than thick, obtusely pointed, slightly furrowed on each edge, marked at equal intervals with eight filiform ridges, the lateral ridge on each side usually occurring in the furrow.

Eastern Mendocino Co., apparently the same thing also in the Vaca Mts. Stone remarkable for the longitudinal line-like ribs in relief at regular intervals.

ARISTOLOCHIACEAE. BIRTHWORT FAMILY.

Perennial herbs or twining shrubs. Leaves simple, alternate, petioled, cordate. Flowers perfect, apetalous, with a petal-like synsepalous 3-lobed calyx. Stamens 6 to 12 with extrorse anthers. Styles 6 or 1. Ovary inferior, 6-celled. Fruit a fleshy or dry capsule. Seeds in 1 or 2 rows on the inner angle of each cell, with a minute embryo in copious endosperm.

Calyx regular, persistent; capsule irregularly dehiscent.....1. *ASARUM*.
Calyx irregular, deciduous; capsule septicidally dehiscent.....2. *ARISTOLOCHIA*.

1. *ASARUM* L.

Nearly acaulescent herbs with fragrant slender creeping rootstocks bearing 2 or 3 scale-like bracts, then 1 or 2 reniform or cordate leaves on long closely approximate petioles and a short-peduncled flower close to the ground in the axil of the lower leaf. Calyx regular, campanulate, the limb 3-parted, the lobes spreading or recurved. Stamens 12, nearly free from the styles, at first reflexed, the alternate ones shorter; filaments more or less distinct, the connective usually continued beyond the anther into a point. Styles 6, more or less united. Capsule globose, fleshy, commonly bursting irregularly. Seeds large, thick, in 2 rows each cell. (Derivation obscure.)

1 *A. caudatum* Lindl. WILD GINGER. Evergreen herb; leaves cordate-reniform, shortly acute or obtusish, pubescent below and above on the veins, 3 to 6 in. broad, on petioles $3\frac{1}{2}$ to 7 in. long; peduncles 6 to 12 lines long; calyx-lobes triangular or oblong, attenuate into a tail which is 1 to $2\frac{1}{4}$ in. long; filaments stout, the free apex of the connective much shorter than the anther; styles united, equaling the stamens.

Deep shade of Coast Range woods: Santa Cruz Mts.; Oakland Hills; Marin

Co.; Napa Valley; Cahto (Mendocino Co.). Following rather closely the distribution of the Redwood. Not in inner Coast Ranges. A. LEMMONII Wats. is very similar; calyx-lobes only 4 to 6 lines long.—Plumas Co., etc. A. HARTWEGII Wats.; leaves strikingly mottled, glabrous above; calyx-lobes caudate-attenuate, 1 to 1½ in. long; connective as long or twice as long as anther; styles nearly distinct.—Sierra Nevada, 4,000 to 7,000 ft., common; west to New River, Trinity Co.

2. ARISTOLOCHIA L. PIPE VINE.

Twining shrubs with sparingly branched stems and axillary pendulous flowers. Calyx tubular, strongly curved and pipe-shaped. Anthers 6, rarely 7 or 8, sessile, disposed in pairs and adnate to the short simple style. Stigma 3 to 6-lobed or -angled. Capsule 6-angled and 6-valved, septicidally dehiscent. Seeds horizontal, in one row in each cell, numerous. (Greek aristos, best, locheia, parturition, from its supposed efficacy in child-birth.)

1. *A. californica* Torr. DUTCHMAN'S PIPE. Deciduous woody climber, twining 5 to 12 ft. high on shrubs, the herbage more or less pubescent, sometimes silky; leaves ovate, cordate, 1½ to 3 (or 5½) in. long, on petioles 1 or 2 in. long or less; pedicels ¾ in. long, with a bract at the middle; calyx greenish, veined with purple, 1½ to 1½ in. long; inside of tube near the base with a broad dull purple band; limb 2-lipped, the upper of 2 broad obtuse lobes, the lower entire, all lined with a disk-like thickening which on the upper side is continued downward and at the angle forms a projection partially closing the tube; ovary clavate; stigma with 3 broad obtuse lobes; capsule broadly oblong-obovate, abruptly contracted to a slender base, 6-winged, 2 to 2½ in. long; seeds cuneate-obovate, 3 lines long, deeply concave on the upper side, the edges incurved, with a very prominent spongy raphe in the concavity.

Coast Range hills from Monterey Co. (acc. Bot. Cal.) and Contra Costa Co. to Mt. Shasta, thence southward in the Sierra Nevada foothills to Butte Co. Most frequent in the North Coast Ranges from the Vaca Mts. to Sonoma Co. Mar.-Apr.

LORANTHACEAE. MISTLETOE FAMILY.

Evergreen shrubs, parasitic on trees. Branches dichotomous. Leaves opposite, simple and entire, or often reduced to connate scales. Flowers dioecious (in ours), greenish and inconspicuous, regular, apetalous. Sepals 2 to 5. Stamens as many as the sepals and inserted upon them; anthers 1 or 2-celled. Ovary inferior, 1-celled. Fruit a berry with glutinous endocarp. Embryo straight, in copious endosperm.

Berry sessile; flowers globose; leaves (in ours) foliaceous.....1. PHORADENDRON.
Berry on a recurved pedicel; flowers mostly compressed; leaves scale-like and connate... 2. ARCEUTHOBium.

1. PHORADENDRON Nutt. MISTLETOE.

Parasitic on mostly deciduous trees, the stems much branched and swollen at the nodes. Leaves foliaceous and coriaceous, or scale-like. Flowers sunk in the joints of the jointed spikes, usually several to each scale. Staminate calyx commonly 3-lobed, the anthers 2-celled, sessile on the base of the lobes. Pistillate calyx adherent to the ovary, the 3 teeth persistent on the globose semitransparent mucilaginous sessile berry. (Greek phor, a thief, and dendron, a tree.)

Leaves elliptic to oblong, 3 or 5-nerved.

Herbage yellowish1. *P. flavescens*.
Herbage greenish2. *P. villosum*.
Leaves narrowly oblong or spatulate, nerveless.....3. *P. bolleanum*.

1. *P. flavescens* Nutt. YELLOW MISTLETOE. Foliage yellowish green; leaves orbicular to ovate or narrowly elliptic, obtuse, $3\frac{1}{2}$ in. long or less, conspicuously 5-nerved from the base and distinctly petioled; fruiting spikes dense, $1\frac{1}{2}$ in. long or less; berries white, 2 lines in diameter.

Interior of California on Common Cottonwood and California Buckeye, the Cottonwoods frequently killed by the parasite. The haustoria spread in the bark of Buckeye branches and by buds give rise to a twiggly growth.

2. *P. villosum* Nutt. COMMON MISTLETOE. Foliage deep green; leaves elliptic, obtuse, 3-nerved, 1 in. long, on short petioles; berries pinkish, $1\frac{1}{2}$ lines in diameter.

Coast Range and Sierra Nevada foothills, parasitic on oaks. Observed by the author on the following species: *Quercus douglasii*, *lobata*, *wislizenii* and *kelloggii*.

3. *P. bolleanum* (Seeman) Eichler. Stems $\frac{1}{2}$ to $\frac{3}{4}$ ft. long; leaves narrowly oblong or spatulate, obtuse, contracted to a short petiole, $\frac{1}{2}$ to 1 in. long; bracts ciliolate; spikelets short, mostly less than $\frac{1}{4}$ in. long, opposite or in fours; berries pearl-like on account of their whiteness, translucency and luster, rather less than 2 lines in diameter.

Coast Ranges, on cypress and juniper, rare in our region.

2. ARCEUTHOBIUM Marsch-Bieb.

Plants yellow or yellowish brown, leafless, fragile-jointed, parasitic on coniferous trees. Stems quadrangular or angled. Leaves represented by connate scales. Flowers solitary or several in each axil, crowded into apparent spikes, opening in autumn. Staminate flower:—calyx mostly 3-parted, compressed; stamens consisting of a single 1-celled roundish anther, opening by a circular slit. Pistillate flower:—calyx 2-cleft, the teeth laterally disposed, the ovary ripening the next autumn after flowering and exerted on the recurved pedicel. Berry circumscissile near the base, when fully ripe explosively dehiscent at a touch or when teased, the glutinous seed being expelled to a distance of several feet. (Greek *arkeuthos*, juniper, and *bios*, life.)

1. *A. occidentale* Engelm. PINE MISTLETOE. Stems dichotomously branched, 4 to 15 in. long, the branches bearing numerous spikes, the lower spikes commonly with accessory spikes in the axils; staminate spikes deep yellow, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; staminate flowers exceeding 1 line in breadth; pistillate plants olive-brown; spikes short, 5 or 6-flowered, arranged along the axis of the inflorescence, the upper spikelets mostly reduced to 1 flower, and the inflorescence paniculate; berries brown, oblong, tapering to each end, 2 to $2\frac{1}{2}$ lines long.—(*Razoumofskya occidentalis* Ktze.)

Coast Ranges and Sierra Nevada, on Digger Pine and Yellow Pine.

SYMPETALAE.

Calyx usually present, mostly herbaceous and synsepalous, often strongly modified. Corolla sympetalous. Stamens inserted on corolla. Pistil 1 and compound (except *Asclepiadaceae* and *Apocynaceae*).

ERICACEAE. HEATH FAMILY.

Trees, shrubs or herbs. Leaves simple, alternate in all our genera except *Chimaphila*, mostly evergreen and stiff and coriaceous. Flowers regular and symmetrical, with the parts in 5s, rarely in 4s. Stamens free from the corolla, as many or commonly twice as many as its lobes or petals and distinct from

them; anthers 2-celled, opening by a terminal pore or sometimes longitudinally, frequently bearing two awn-like appendages. Ovary superior or inferior, 4 to 10 (rarely 1, 2 or 3)-celled, with usually axile placentae bearing numerous ovules.—Corolla in most cases sympetalous but sometimes choripetalous. Rhododendron has a slightly irregular corolla. The red or white flowers are pendulous as a rule and the pollen-grains are often united in 4s (tetrads).

A. Corolla choripetalous; fruit a capsule.

Herbs or herb-like.

Anthers opening by 2 terminal pores.

Stem leafy; flowers corymbose or umbellate.....1. CHIMAPHILA.

Acaulescent; flowers racemose2. PYROLA.

Anthers opening by a longitudinal slit; saprophyte.....3. PLEURICOSPORA.

Shrubs; anthers opening by 2 terminal pores.....4. LEDUM.

B. Corolla sympetalous; anthers opening by terminal pores or chinks; trees or shrubs.

Calyx-tube free from the ovary.

Corolla funnelform to campanulate; fruit a capsule.....5. RHODODENDRON.

Corolla urn-shaped.

Flowers in a panicle; calyx chorisepalous, dry, persistent in fruit but insignificant; anthers with 2 awns.

Fruit a berry with granular surface; trees.....6. ARBUTUS.

Fruit berry-like but really drupaceous with stony nutlets, and smooth or resinous surface; shrubs7. ARCTOSTAPHYLOS.

Flowers in a raceme; calyx synsepalous, becoming fleshy in fruit and enclosing the capsule8. GAULTHERIA.

Calyx-tube adherent to the ovary; fruit a berry.....9. VACCINIUM.

1. CHIMAPHILA Pursh. PIPSISSEWA.

Low perennial evergreen suffrutescent plants. Leaves alternate or in irregular whorls, serrulate. Flowers white, waxy, in a terminal naked corymb. Calyx 5-parted. Corolla rotate, choripetalous; petals 5, orbicular, concave. Stamens 10; filaments dilated and hairy in the middle. Stigma orbicular-peltate, crowning the very short style which is concealed in the umbilicate summit of the ovary. Capsule 5-celled, dehiscent from above downwards. (Greek cheima, winter, and phileo, to love, the plants evergreen.)

1. *C. menziesii* Spreng. MENZIES PIPSISSEWA. More or less branched from the base, 3 or 4 in. high; leaves ovate, obtuse or acute, 1 in. or less long; peduncles 1 to 3-flowered; flowers 3 lines in diameter; filaments with a roundish dilation at the middle which is covered with short hairs.

Pine woods: Coast Ranges and Sierra Nevada, alt. 3,500 to 6,000 ft., rare.

C. UMBELLATA Nutt. Prince's Pine. Stem often simple, 6 to 10 in. high, bearing several clusters or whorls of leaves and 3 to 6-flowered peduncles; leaves oblanceolate, varying to oblong, sharply serrate from near the base, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; filaments with a roundish dilation at base which is hairy on the margin only.—Pine woods: "Parker's Station, Eureka Trail," Bolander; Hupa Valley, Chandler; Mt. Shasta; Big Oak Flat Road; Placer Co., Carpenter.

2. PYROLA L. WINTERGREEN.

Acaulescent herbs with slender rootstocks, leafless or with radical evergreen leaves. Flowers 5-merous, in a raceme on a naked or sparingly scaly-bracted scape. Petals distinct, concave or incurved, more or less converging. Stamens 10; filaments subulate, naked. Stigma 5-lobed or -toothed, on an elongated style. Capsule 5-celled, depressed-globose and 5-lobed, umbilicate at apex and base, dehiscent from the base upward; edges of the valves cobwebby when opening, persistent on the axis. Embryo minute. (Diminutive of *Pirus*, classical name of the Pear Tree, on account of resemblance in the leaves of one species.)

1. **P. aphylla** Smith. Leafless parasite; stems red, often many and clustered, from a scaly-bracted rootstock, 8 to 16 in. high; calyx red, its lobes triangular-ovate, $\frac{1}{4}$ the length of the obovate or elliptic whitish petals; capsule 3 lines broad, its sutures somewhat cobwebby in dehiscence.

Rare in our district: Santa Cruz Mts., *M. Grace Rowe*; Mt. Tamalpais; Howell Mt.; Mt. St. Helena and northward to Mt. Shasta. Also in the Sierra Nevada. The following species have a cluster of radical leaves and (except the last) a long declined and recurved style.

P. PICTA Smith. White-veined Shin-leaf. Leaves ovate or elliptic, very coriaceous, mottled or veined with white; petiole narrowly winged; calyx-lobes broadly ovate; corolla greenish white or brownish.—Pine forests from Mendocino Co. to Mt. Shasta and southward in the Sierra Nevada.

P. ROTUNDIFOLIA L. var. **BRACTEATA** Gray. Leaves orbicular and comparatively thin, unmottled, on slender unwinged petioles as long as the blade; calyx-lobes triangular-lanceolate; corolla rose-purple.—With the preceding.

P. SECUNDA L. Leaves ovate, thin and greenish; flowers white, in a one-sided raceme; petals with two tubercles at base inside.—Northern Sierra Nevada.

3. PLEURICOSPORA Gray.

Whitish or light brown saprophyte with imbricated scales. Sepals 4 or 5, scale-like, the margins fimbriate. Petals 4 or 5, plane, rather shorter than the sepals. Stamens 8 or 10; filaments ligulate-filiform, glabrous. Ovary ovate, 1-celled, the 4 or 5 parietal placentae large; style columnar; stigma umbilicate-capitate. Fruit a watery berry. (Greek pleuricos, at the side, and spora, seed, the placentae parietal.)

1. **P. fimbriolata** Gray. Plant spike-like, 2 to 8 in. high; spike dense; corolla whitish, 5 lines long.

Mariposa Grove, *Bolander*; Lake Tahoe, *Katherine Chandler*; Healdsburg (*Zoe*, iv, 154). The following allied plants are saprophytes with red, brown or dull white herbage and hypogynous flowers in a single terminal spike:

ALLOTROPA VIRGATA T. & G. Reddish or whitish rather fleshy plant; corolla none; ovary 5-celled, as in the next two.—Sierra Nevada in pine woods; Mt. Shasta; *Humboldt Co.*

PTEROSPORA ANDROMEDA Nutt. Pine Drops. Reddish brown plant; flowers racemose; corolla sympetalous; anthers 2-awned at the back.—Sierra Nevada; Lake Co. and northward.

SARCODES SANGUINEA Torr. Snow Plant. Bright red or scarlet plant; flowers in a fleshy scaly spike; corolla sympetalous; anthers not awned.—Sierra Nevada.

HEMITOMES CONGESTUM Gray. Spike capitate, often subterranean; sepals 2; corolla tubular-urn-shaped, 4 or 5-lobed; ovary 1-celled, apparently several-celled by the meeting of adjacent placental plates.—Coast Ranges near the coast, northward.

4. LEDUM L. LABRADOR TEA.

Evergreen shrubs with fragrant herbage. Leaves entire, the margin disposed to be revolute. Flowers white, small, in terminal umbel-like corymbs from large scaly buds. Pedicels slender. Sepals 5, almost distinct, very small. Petals 5, obovate and spreading. Stamens 5 to 10. Capsule 5-celled, dehiscing from the base upward, many-seeded; placentae borne on the summit of the axis of the fruit. (Greek Ledon, ancient name of the *Cistus*.)

1. *L. glandulosum* Nutt. Low, 3 to 5 ft. high; leaves rather thickly clothing the stems, oblong, acute at each end, mucronate at apex, 1 to $2\frac{1}{4}$ in. long, green and glabrous on both sides, or light colored beneath with a gland-dotted felt; petals elliptic-ovate, $2\frac{1}{2}$ to 3 lines long; filaments ciliate toward the base; capsule oval, nearly 2 lines long.

Sierra Nevada, 4,000 to 10,000 ft., and from Pt. Reyes northward along the coast to Oregon. Poisonous to sheep.

5. RHODODENDRON L.

Ours shrubs with alternate entire leaves crowded on the flowering branches. Flowers in umbels or corymbs, from terminal buds with thin deciduous scales. Calyx very small. Corolla funnellform to campanulate, cleft, often somewhat irregular. Stamens 5 or 10; filaments filiform; anthers short, without awns or appendages. Style filiform; stigma capitate or somewhat lobed. Fruit a septical 5-celled capsule, the valves separating from the columella. (Greek rhodos, rose, and dendron, a tree.)

Deciduous; flowers commonly white; stamens 5.....1. *R. occidentale*. Evergreen; flowers rose-purple; stamens 10.....2. *R. californicum*.

1. *R. occidentale* Gray. WESTERN AZALEA. Shrub, 3 to 8 ft. high; leaves narrowly or broadly obovate, 1 to 4 in. long, ciliate, otherwise nearly glabrous; flower buds terminal, surrounded at base by leaf buds which give rise to the shoots of the season; calyx 5-parted, its lobes oblong or oval; corolla white, or sometimes pink, $1\frac{1}{2}$ to nearly 2 in. long, 5-cleft, slightly irregular, the upper lobe with a large yellow splotch; tube conspicuously funnellform, glandular-viscid outside; capsule oblong, $\frac{3}{4}$ in. long.

Middle and seaward Coast Ranges, commonly on stream banks: Santa Cruz Mts.; Marin Co.; Napa Valley; Sonoma Co. and northward. Also in the Sierra Nevada. In the Bay region the white-flowered form usually occurs in shade or in deep cañons, the pink form higher on cañon sides or in sunny situations. Feared by sheepmen as poisonous.

2. *R. californicum* Hook. CALIFORNIA ROSE BAY. Erect, 4 to 8 ft. high; leaves coriaceous and evergreen, oblong or elliptic, green above, rusty or lighter beneath, 3 to 4 in. long; flower buds 1 in. long, the scales ovate; corolla turbinate-campanulate, rose-purple, the upper lobe greenish-dotted within, $1\frac{1}{4}$ in. long; stamens 10, not exserted; ovary densely pubescent with dark red or rusty hairs; capsule nearly or quite glabrous, red, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $2\frac{1}{2}$ lines in diameter.

Seaward Coast Range: Waddell Creek; Pescadero; Mt. Tamalpais and northward to Mendocino and Humboldt cos. Reported poisonous to sheep.

LEUCOTHOE DAVISIAE Torr. Shrub 3 to 4 ft. high; leaves coriaceous, oblong, 1 to 3 in. long; flowers white, pendulous, in erect racemes 2 to 4 in. long; corolla ovate with narrow orifice, 3 lines long; anthers 2-mucronate, not awned.—Sierra Nevada, about 7,000 ft., rather rare.

CASSIOPE MERTENSIANA Don. Heath-like fruticulose evergreen, with scale-like triangular leaves (1 line long) crowded and imbricated on the stems in four ranks; corolla white, open-campanulate, nodding on the apex of an erect naked peduncle; stamens 10, anthers awned.—Alpine in the Sierra Nevada and northward.

BRYANTHUS BREWERI Gray. Heath-like fruticulose evergreen 4 to 12 in. high; leaves linear, 3 to 7 lines long; corolla rose-color, deeply saucer-shaped, 5-cleft nearly or quite to middle, the lobes recurving from the tip; stamens

7 to 10, exserted; anthers awnless.—Sierra Nevada, 7,000 to 12,000 ft. Called "Alpine Heather." *B. EMPETRIFORMIS* Gray. Corolla campanulate, the 5 stamens included.—Mt. Shasta, Marble Mt. and northward.

KALMIA POLIFOLIA Wang. Fruticulose, 3 to 12 in. high; corolla rose-purple, saucer-shaped, 10-saccate, the 10 stamens with their awnless anthers lodged in the sacs in bud.—Alpine in the Sierra Nevada (*K. glauca* Ait.). Leaves probably poisonous to cattle.

6. *ARBUTUS* L. *ARBUTE* TREE.

Evergreen trees or shrubs with glossy leathery leaves. Flowers in a terminal panicle of dense racemes. Bracts and bractlets scale-like. Calyx small, 5-parted. Corolla globular or ovate, 5-lobed at apex. Stamens twice as many as the corolla-lobes, included; filaments soft-hairy; anthers with a pair of reflexed awns on the back. Ovary on a hypogynous disk, 5 or rarely 4-celled, the ovules crowded on a fleshy placenta which projects from the inner angle of each cell. Fruit a many-seeded berry with granular surface. (Latin name of the Arbuté tree under which, says Horace, idle men delight to lie.)

1. *A. menziesii* Pursh. MADRONA. Widely branching tree 20 to 125 ft. high; bark polished, crimson or terra cotta, or on old trunks dark brown and fissured into small scales; leaves narrowly elliptic or ovatis, 3 to 6 in. long, glabrous, dark green and polished above, glaucous beneath, entire, or on vigorous shoots, finely serrate; flowers white; corolla 3 lines long, with 5 very small lobes recurving from the small opening, and 10 semitransparent glands in a circle at base with a slight constriction above them which becomes obvious on drying; fruit somewhat depressed globose, 4 to 5 lines in diameter, fleshy but rather dry, red or orange color; seeds somewhat angular, closely crowded, 5 or 6 in a cell.

Coast Ranges, most common toward the coast in our region: Santa Cruz Mts.; Oakland Hills; Mt. Tamalpais; Sonoma and Napa cos. Sierra Nevada, mostly northward, but not common. Growing on high ridges, mountain slopes and in gravelly valleys, it reaches its greatest development in Mendocino and Humboldt counties where, on account of its habit and varying expression of growth in association with Oregon Oak and Black Oak, Douglas Fir and Redwood and its wonderful play of bark and leaf color, it is a source of never-ending study and delight to the botanical traveler.

7. *ARCTOSTAPHYLOS* Adans. MANZANITA.

Evergreen shrubs with very crooked branches, the bark dark red or chocolate-colored, smooth and polished; wood hard but brash. Leaves commonly entire, more or less vertical by twisting of the petiole. Flowers white or pink, in terminal subglobose clusters or panicles composed of short racemes, the parts usually in 5s. Bracts commonly scaly. Sepals distinct. Corolla urn-shaped. Stamens and anthers as in *Arbutus*; filaments thickened above the base and hairy at the middle. Ovary raised on a hypogynous disk, 4 to 10-celled, with one ovule in each cell, in fruit forming a drupe or dry brown "berry" with several stony nutlets. Nutlets distinct, irregularly united in 2s or 3s, or sometimes consolidated into a single stone; pulp mealy or in late summer powdery.—The individuals are very abundant and in the company of Buck Brush, Scrub Oak, Pickeringia and other spiny shrubs, form the exceedingly extensive brush thickets known as chaparral which impart a marked character to the scenery of the higher Coast Range ridges and mountain summits. (Greek *arktos*, a bear, and *staphule*, a grape; bears feed on the berries.)

- Fruit small, 2 lines long or less; leaves less than 1 in. (mostly $\frac{1}{2}$ in.) long, strictly erect1. *A. nummularia*.
 Fruit 3 to $4\frac{1}{2}$ lines long; leaves exceeding 1 in. (mostly $\frac{1}{2}$ to 2 in.) long.
 Branchlets commonly bristly; ovary bearded.
 Leaves cordate at base2. *A. andersonii*.
 Leaves oblong-lanceolate to ovate3. *A. tomentosa*.
 Branchlets glabrous or pubescent; ovary glabrous.
 Pedicels glabrous.
 Leaves light green, glaucescent; calyx equaling or slightly exceeding diameter of corolla4. *A. manzanita*.
 Leaves vivid green, never glaucescent; calyx $\frac{1}{2}$ diameter of corolla.....5. *A. stanfordiana*.
 Pedicels glandular-pubescent; leaves glaucous.....6. *A. glauca*.

1. *A. nummularia* Gray. Strictly erect, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high; branchlets pilose-pubescent, the foliage glabrous and shining; leaves orbicular to elliptic-ovate, entire, veiny on the under surface, thickly clothing the branches, 5 to 11 (commonly about 6) lines long, on petioles 1 line long; flowers white, little exceeding 1 line; ovary bearded; fruit oblong, 2 lines long, the nutlets usually 4. Mendocino "White Plains"; Mt. Tamalpais and Santa Cruz Mts. Distribution restricted but locally abundant.

A. NEVADENSIS Gray. Main stems creeping, the erect branches 3 to 9 in. high; leaves small.—Common in the upper portion of the Sierra Nevada timber belt.

2. *A. andersonii* Gray. Four to 6 ft. high; branchlets with copious straight spreading hairs or bristles and with glandular indument, the foliage glabrous and glaucous; leaves oblong or varying from broadly to narrowly ovate, obtuse, or acute, cuspidate, cordate at base or even auriculate, serrulate below the middle, commonly sessile, or sometimes with a short to 2 or 3 lines long petiole; secondary peduncles of the panicle rather long; bracts lanceolate; fruit viscid-pubescent.

Summit of the Oakland Hills and in the Santa Cruz Mts. near the Redwood "big trees" at Felton. Variable in its character, some specimens showing entire leaves without the cordate base. Too near the next.

3. *A. tomentosa* Dougl. Branching shrub, 4 to 8 ft. high; branchlets usually with a glandular indument and spreading bristly hairs; leaves with a fine close tomentum or glabrous, narrowly or broadly oblong to ovate, from obtuse to subcordate at base, acute or obtuse at apex, entire or rarely spinulose-serrulate, 1 to 2 in. long, on very short petioles; bracts linear-lanceolate, the lower foliaceous; flowers white; filaments pilose-pubescent; ovary hirsute; nutlets separable or more or less united.

Coast Ranges toward the coast. The most common species after *A. manzanita*, and usually distinguishable from it by the conspicuous foliaceous bracts.

4. *A. manzanita* Parry. COMMON MANZANITA. Shrub, 3 to 12 ft. high, commonly widely branched from the base with long straggling crooked branches, sometimes becoming almost elephantine in its proportions and up to 18 ft. high; young twigs and peduncles finely puberulent; pedicels glabrous; leaves elliptic and obtuse at base and apex, the larger orbicular, the smaller oblong and often tapering from the middle to the acute base and apex, 1 to 2 in. long, ostensibly glabrous; panicle as broad or broader than high, pendulous on the short abruptly recurved peduncles; flowers commonly white, or tinged with pink; bracts small and dry; calyx closely appressed to the base of the corolla and as broad; corolla broad; stamens with a hairy tuft on back of filaments at expanded portion; ovary glabrous; fruit smooth, dull white in early summer, becoming deep reddish brown in late summer and autumn; nutlets irregularly

coalescent, usually 2 or 3 consolidated (indicated by the number of cells) with intermediate (1-celled) ones.

Covering large areas of the high dry Coast Range slopes, where gregarious remarkably uniform in height, about 4 to 6-ft. high.

5. **A. stanfordiana** Parry. MYACOMA MANZANITA. Erect not widely branched shrub 3 to 5 ft. high with very slender dark red stems, perfectly glabrous in all its parts; leaves bright green on both faces, narrowly ovate to oblanceolate, most frequently acute at both ends, petioled, 1 to 1½ in. long, very erect; flowers abundant, in elongated racemes, forming an open panicle, light pink to lilac; corolla seldom over 3 lines long, very frequently with an obscure constriction just below the middle; calyx reddish, only half the diameter of the corolla, somewhat impressed as it were within the truncate or subcordate base of the latter and thus partly concealed; ovary glabrous; nutlets broader than high, usually two or more coherent, rarely all united into a single irregular stone.

Howell Mt., Mt. St. Helena and northward to the neighborhood of Red Mt. east of Ukiah. A beautiful and rather rare shrub (cf. *Erythea*, vii, 111).

6. **A. glauca** Lindl. GREAT-BERRIED MANZANITA. Shrubby or almost arborescent, 9 to 25 ft. high, with a trunk often 1 ft. in diameter; foliage glabrous and glaucous; leaves elliptical to broadly ovate or oblong, entire, acute or obtuse at apex, obtuse, truncate or even subcordate at base, 1¼ to 2 in. long; petioles 3 to 4 lines long; panicle broader than high, frequently very compact; pedicels glandular-pubescent; flowers white, rather large; fruit usually viscid, pulp scanty; nutlets completely consolidated into a solid smooth stone.

Interior species: Mt. Diablo, Los Gatos and southward. Also in the Sierra Nevada.

8. GAULTHERIA

Ours a fruticose evergreen, with spicy-aromatic leaves and flowers in racemes. Calyx 5-cleft. Corolla oval-urn-shaped, 5-toothed at the narrow orifice. Stamens 10; anthers with a pair of spreading awns from the summit of each cell; filaments dilated at base. Ovary 5-celled; stigma entire. Capsule loculicidal, deeply umbilicate, enclosed by the enlarged and fleshy calyx. (Dr. Gaultier, Canadian physician and botanist.)

1. **G. shallon** Pursh. SALAL. Stems erect or ascending, 1 to 5 ft. high; leaves ovate or orbicular, slightly cordate at base, finely serrate, 2 to 4 in. long; petioles 1 to 2 lines long; racemes axillary or terminal, glandular viscid, 3 to 6 in. long; bracts scaly, ovate, concave, often reddish; pedicels declined, bearing bracts below the middle; corolla pink or pinkish white, 4 lines long; fruit berry-like, globose, black.

Redwood region from the Santa Lucia Mts., Redwood Peak (Alameda Co.), and Marin Co. to Humboldt Co. and northward into the Douglas Fir region of Oregon and Washington. Commonly abundant and covering thickly the forest floor. Mar.-May.

9. VACCINIUM L.

Shrubs or bushes, or on high mountain peaks or ridges, dwarfish or depressed woody plants. Calyx-tube adnate to the ovary, the limb 5-parted or -lobed, or entire. Corolla globular or urn-shaped to oblong-cylindric, 5 (or 4)-toothed. Stamens 10 (or 8); anthers (except in *V. ovatum*) bearing on the back two upwardly curved awns, each cell prolonged at apex into a tube-like appendage opening at the tip by a pore. Ovary 4 or 5-celled, the cells several to many-

seeded. Fruit a berry, crowned with the vestiges of the calyx-teeth. (Classical Latin name of the Bilberry.)

Evergreen; flowers in clusters; filaments hairy; anthers awnless.....V. OVATUM.
Deciduous; flowers solitary; filaments glabrous; anthers awned.....V. PARVIFOLIUM.

1. **V. ovatum** Pursh. CALIFORNIA HUCKLEBERRY. Erect evergreen shrub, 4 to 8 ft high; leaves coriaceous, shining above, oblong-ovate, serrate, short-petioled, persisting 4 or 5 years, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; corolla oblong-campanulate, pink; berry dark purple, without bloom.

North slopes of hills near the coast, especially in the Redwood region: Monterey Co.; Oakland Hills; Marin Co. and northward.

2. **V. parvifolium** Smith. RED BILBERRY. Deciduous shrub, 5 to 8 ft. high; branches and branchlets slender, very sharply angled, green, articulated; leaves scattered, mostly oval, pale beneath, entire, 5 to 10 lines long; pedicels $2\frac{1}{2}$ to 4 lines long, deflexed in fruit but not usually curved; calyx slightly 5-lobed; corolla globular, greenish; berries red.

Redwood region,* from the Santa Cruz Mts. to Cazadero, Mendocino and Humboldt cos. and northward. The following species are all deciduous with 1 or rarely 2 flowers in a place, glabrous filaments, awned anthers, and berry blue with a bloom:

V. ovalifolium Smith. Tall Bilberry. Straggling, 4 to 8 ft. high, the branchlets angular; leaves 1 to $1\frac{1}{2}$ in. long; corolla ovoid; calyx 5-lobed.—Northern Sierra Nevada, 4,500 ft. and northward. **V. occidentale** Gray. Sierra Bilberry. Shrub $1\frac{1}{2}$ to 2 ft. high; branchlets not angular; leaves entire, only slightly veiny, 6 to 9 lines long; calyx 5-parted; corolla oblong-cylindric.—Sierra Nevada, 5,000 to 7,000 ft. **V. caespitosum** Michx. Dwarf Bilberry. Dwarfish, caespitose, 3 to 5 in. high; branchlets not angled; calyx entire or obscurely lobed; corolla ovoid.—High Sierra Nevada, Lake Tahoe and northward.

PRIMULACEAE. PRIMROSE FAMILY.

Herbs with simple undivided leaves. Flowers perfect, regular and symmetrical, 4 to 8-merous, commonly 5-merous, axillary and solitary, or in terminal racemes or umbels. Stamens opposite the lobes of the corolla and inserted on its tube or base. Ovary 1-celled, with a single style and stigma, superior, except in *Samolus*, where it is attached to the base of the calyx; ovules on a free central placenta. Fruit a capsule.

Corolla-lobes erect or spreading, not reflexed.

Stemless; leaves all in a radical cluster; flowers in umbels.....1. *ANDROSACE*.
Stems leafy.

Ovary adnate to base of calyx; flowers in racemes.....2. *SAMOLUS*.

Ovary free from calyx.

Capsule longitudinally dehiscent.

Corolla present; leaves in a single whorl at summit of stem.....3. *TRIENTALIS*.

Corolla none; leaves opposite, in many pairs.....4. *GLAUX*.

Capsule circumscissile; flowers axillary and solitary.

Corolla longer than calyx, red; leaves opposite or ternate.....5. *ANAGALLIS*.

Corolla shorter than calyx; leaves alternate.....6. *CENTUNCULUS*.

Corolla-lobes reflexed; flowers in umbels borne on naked scapes.....7. *DODECATHEON*.

1. ANDROSACE L.

Small montane or alpine herbs, with rosulate radical leaves and few to several scapes bearing an involucrate umbel of small white or pink-tinted flowers. Calyx-lobes 5. Corolla somewhat salverform, its lobes 5 (or 4), its tube shorter than the calyx, its throat constricted; stamens short and inserted low down upon the tube. Style mostly short. Capsule subglobose, dehiscent by

valves. Seeds few or many. (Androsakes, Greek name of a now unknown sea-plant.)

1. **A. septentrionalis** L. Annual, erect, $1\frac{1}{4}$ to 3 in. high; leaves of the radical tuft linear to lanceolate, rarely oblong, entire or obscurely toothed, 3 or 4 lines long; scapes 1 to 3, erect; inflorescence umbellate; involueral bracts ovate or lanceolate, occasionally very broad at base; pedicels filiform, unequal, $\frac{1}{4}$ to 1 in. long; corolla not exceeding the calyx-lobes, 1 line long; calyx-lobes mostly shorter than its tube, subulate-lanceolate.

Berkeley Hills, Mt. Diablo, and far northward and eastward.

PRIMULA SUFFRUTESCENS Gray. Sierra Primrose. General habit of Dodecatheon; leaves thickly crowded on creeping stems, cuneate-spatulate, toothed at apex; scape 2 to 4 in. long, bearing an umbel of several flowers; corolla red, its tube surpassing the calyx, its limb $\frac{1}{2}$ in. broad with spreading emarginate or obovate lobes.—Crevices of rocks, alpine in the Sierra Nevada.

2. SAMOLUS L. BROOKWEED.

Glabrous perennial herbs with alternate leaves. Flowers small, white, 5-merous, in terminal racemes. Calyx adherent to the base of the ovary, campanulate. Corolla nearly campanulate. Stamens 5, borne on the tube of the corolla, their filaments short; a second series of stamens represented by 5 sterile filaments or staminodia inserted in the sinuses of the corolla and alternating with the anther-bearing stamens. Capsule opening at the apex by 5 valves. (Celtic name.)

1. **S. floribundus** H.B.K. WATER PIMPERNEL. Stem commonly solitary, erect, simple or branching above into 2 or 3 racemes, or paniculate, 6 to 10 in. high; radical leaves rosette-like, round-obovate to oblong-spatulate, obtuse or almost truncate, narrowed toward the base into a broad short petiole, $1\frac{1}{2}$ in. long; cauline leaves similar, the uppermost varying to elliptic, 3 lines long or more; pedicels slender, bractless, but bearing minute bractlets at their middle; calyx-teeth short, broadly triangular; petals very small, white.—(S. valerandi L. var. americanus Gray.)

Brooks and marshes, rare within our limits; Suisun Marshes; Antioch; San Bernardino. Far eastward across the continent.

3. TRIENTALIS L.

Low and glabrous perennials. Rootstocks tuberous, sometimes stoloniferous. Stem simple, bearing scales or small leaves below and a whorl of large leaves above, from the center of which the filiform peduncles arise. Flowers commonly 6 (5 or 7)-merous. Corolla rotate, deeply parted. Filaments long and filiform, united at base into a very short ring. Style filiform. Capsule valves 5, revolute. (Latin trientalis, containing one-third of a foot, in allusion to the height of the plants.)

1. **T. europaea** L. var. **latifolia** Torr. STAR-FLOWER. Stems 4 to 6 in. high, from tubers $\frac{1}{3}$ to nearly 1 in. long; leaves of the involueral whorl 5 or 6, 1 to 2 in. long, broadly obovate, abruptly acute, drawn down to a very short petiole; peduncles $\frac{3}{4}$ to 2 in. long; corolla white or rose-red, about 4 lines broad, its divisions abruptly acuminate and prolonged into a slender point; calyx-lobes narrowly linear-lanceolate, mucronate, exceeding the capsule.

Coast Range woods, mostly in the seaward and middle ranges from Monterey northward. Also in the Sierra Nevada. May-June.

4. GLAUX L.

Somewhat succulent perennial with opposite leaves, distinguished from all

other genera of the order by the absence of a corolla. Calyx purplish or white, campanulate, 5-lobed, assuming the appearance of a corolla, the stamens alternating with its lobes. Capsule 5-valved at apex. Seeds few, immersed in the tissue of the placenta. (Greek *glaukos*, sea-green.)

1. *G. maritima* L. SEA MILKWORT. Herbage somewhat succulent; running rootstocks slender; stems 8 to 11 in. high, erect, or ascending from a decumbent base, simple or eventually branching; leaves oblong, 4 to 7 lines long; flowers less than 2 lines long, solitary in the axils, almost sessile; calyx-segments elliptic; capsule globose, a little over 1 line long.

Marshy shores of Tomales, San Francisco and Suisun bays. June.

5. ANAGALLIS L. PIMPERNEL.

Low herbs with opposite or sometimes ternate entire leaves. Flowers axillary, on slender pedicels. Calyx deeply 5-cleft into narrow segments. Corolla rotate, deeply 5-parted, the rounded lobes convolute in the bud. Stamens 5; filaments hirsute or pubescent. Capsule circumscissile. (Greek, meaning delightful.)

1. *A. arvensis* L. POOR MAN'S WEATHER-GLASS. Stems 1 ft. long, procumbent or ascending; leaves deltoid-ovate, acute, sessile, 4 lines long, shorter than the pedicels; sepals lanceolate, acuminate, scarious-margined toward the base, nearly distinct; corolla vermilion, 4 to 5 lines broad, the petals lightly joined at base, minutely glandular-ciliate at apex; capsules on recurved pedicels; seeds $\frac{1}{2}$ line long, triangular, the surface pitted.

Naturalized Old World weed, mostly near the coast: common about San Francisco Bay.

6. CENTUNCULUS L.

Very small annuals with alternate entire leaves and minute solitary flowers in their axils. Calyx 4 (or 5)-parted, the narrow lobes linear-lanceolate, acuminate. Corolla 4 (or 5)-cleft, the tube subglobose and lobes acute. Stamens 4 or 5, inserted on the throat of the corolla. Capsule globose, circumscissile. Seeds many. (Meaning of name obscure.)

1. *C. minimus* L. CHAFFWEED. Slender, glabrous, 1 to 5 in. high; leaves obovate, sessile or short-petioled, 1 to 2 lines long; flowers sessile or very nearly so, shorter than the leaves, mostly 4-merous, filaments much dilated at base.

Moist ground: near San Francisco, Kellogg, 1866; Laundry Farm; Antioch (Zoe, v, 144); Humboldt Bay, Chandler, and northward.

7. DODECATHEON L. SHOOTING STAR.

Low perennial herbs with radical leaves and a naked scape bearing an umbel of few or many flowers. Corolla 5-parted, with very short tube and dilated thickened throat, the long and narrow divisions reflexed in flower (as also the calyx-lobes). Stamens on the throat of the corolla; filaments short and flat, monadelphous, but at length separable above. Style filiform, exserted. Fruit a capsule with columnar placenta, surrounded at base by the now erect calyx. (Greek *dodeka*, 12, and *theos*, god, the Primrose being under the care of the deities. Singularly handsome flowers similar to those of the cultivated *Cyclamen*.)

Flowers rose-purple; plants commonly 6 to 12 in. high.....1. *D. hendersonii*.
Flowers white or cream-color; plants 3 to 4 in. high.....2. *D. patulum*.

1. *D. hendersonii* Gray. MOSQUITO BILLS. SAILORS' CAPS. Scapes red or reddish, 9 to 14 in. high, from a strong cluster of fleshy-fibrous roots; leaves elliptic, often widest below the middle, the margin more or less crisped, 1 to $1\frac{3}{4}$ in. long, on petioles about as long; umbels 3 to 13-flowered, the pedicels $3\frac{1}{2}$

in. long or less; flowers 5, rarely 4-merous; calyx cleft into ovate-lanceolate lobes; petals oblong, 7 lines long, purple with a transverse yellow band at base, which is edged above by white and bounded below by a black-purple area; filaments black-purple; anthers clavate, 2 lines long; capsule oblong, circumscissile well below the summit.

Very common on low slopes of the Coast Range hills and ascending to the higher ridges; Santa Clara Co. to Napa Co. and northward into Oregon. Also in the Sierra Nevada at lower altitudes. Feb.-Apr. The very short perennial caudex produces elongated fleshy bulblets which are borne on the sides, often in great quantity; these are cast off in the autumn and in the next season give rise to a single leaf, flowering in the second or third season. The bulblets are white and suggestive of the "rice-grain" bulblets of the Checker Lily (*Fritillaria lanceolata*).

2. *D. patulum* Greene. SHOOTING STAR. Similar to the preceding but very low, only 3 or 4 in. high and the roots much more rigid; corolla white, pale cream-color or rarely pinkish; anthers 1 line long; capsule short-oblong or subglobose, circumscissile near the summit.

Subsaline plains of the lower Sacramento Valley and southward to the Livermore Valley. Mar.

PLUMBAGINACEAE. THRIFT FAMILY.

Maritime acaulescent herbs with commonly hard or coriaceous stems and leaves. Flowers regular, perfect, 5-merous throughout. Calyx tubular or funnel-form, plaited. Petals with long claws barely united into a ring at base. Stamens opposite the petals, adnate to the base of the claw. Ovary superior, 5-angled at summit, containing a single ovule which hangs from an elongated funiculus arising from the base of the cell. Styles 5. Fruit a utricle or achene, borne in the base of the persistent calyx. Seed with endosperm; embryo straight.

Leaves narrowly linear; inflorescence head-like.....1. *ARMERIA*.
Leaves broad; inflorescence paniculate2. *STATICE*.

1. *ARMERIA* Willd. THRIFT.

Leaves narrowly linear, sedge-like, in a close tuft. Scape naked, terminating in a globose head of flowers. Heads composed of numerous crowded clusters, each cluster subtended by a scarious bract, the outer bracts forming an involucre, the two outermost united and forming a reversed sheath to the summit of the scape. Flowers in a cluster pediceled or subsessile, subtended by bractlets. Calyx scarious, funnel-form. Corolla of 5 apparently distinct long-clawed petals, each with a stamen on its base. Styles filiform, united at the very base. (Latin name of a Pink, transferred to Thrift.)

1. *A. vulgaris* Willd. SEA PINK. Leaves flat or revolute-channeled; scapes 9 to 18 in. high, few or solitary; flowers dull pink or flesh-color; calyx-tube 10-nerved, the nerves densely hispid; limb of the calyx more or less erose.—(*Statice armeria* L.)

Common on the sandy beaches or fields near the sea along the California coast or about San Francisco Bay. May-June.

2. *STATICE* L. MARSH ROSEMARY.

Leaves broad, fleshy, in a radical tuft. Flowers secund, in short spikes or clusters terminating the many branchlets of a branching scape. Calyx hairy on the angles below. Styles wholly distinct. (Greek *statike*, astringent.)

1. *S. limonium* L. var. *californica* Gray. Root $\frac{1}{2}$ to 1 in. thick, reddish,

woody; leaves obovate- to oblong-spatulate, obtuse or sometimes retuse, tapering below into a rather long petiole, 4 to 9 in. long; scapes 1 to 2 ft. high, loosely paniculate; flowers violet-purple; petals oblong, narrowed towards the base, 2 to $2\frac{1}{2}$ lines long.

Common about San Francisco Bay and along the coast. July-Dec.

OLEACEAE. ASH FAMILY.

Trees or shrubs, mostly with opposite leaves. Flowers small, commonly in panicles, mostly unisexual. Stamens few (1 to 4). Ovary superior, 2-celled; style one. Fruit a samara, capsule or drupe.—*Forsythia*, *Lilac*, *Olive* and *Privet* are cultivated with us.

1. FRAXINUS L. ASH.

Leaves deciduous, pinnately compound (except one species); terminal leaflet on a longer stalk than the lateral, or the lateral leaflets sessile. Flowers in small crowded panicles, appearing just before the leaves and from separate buds. Calyx small, truncate, with toothed border. Corolla with 2 equal petals or none. Stamens 2 (rarely 1 or 3). Ovules 2 in each cell. Fruit a 1-seeded samara, with terminal wing. (The Latin name of the ash.)

Flowers dioecious; corolla none; style conspicuously 2-lobed; leaflets mostly sessile, 2 in. long or more; branchlets of the season terete.....1. *F. oregona*.
Flowers mostly perfect; corolla present; style obscurely lobed; leaflets mostly stalked, less than 2 in. long; branchlets of the season 4-sided and 4-winged.....2. *F. dipetala*.

1. *F. oregona* Nutt. OREGON ASH. Tree 30 to 80 ft. high; leaves 6 to 12 in. long; leaflets 5 to 7, oblong to oval, or often broadest toward the apex and abruptly short-pointed, usually sessile except the terminal one, entire or toothed above the middle, 2 to $5\frac{1}{2}$ in. long; stamens 2 (sometimes 1 or 3); samara oblong-lanceolate, $1\frac{1}{4}$ to 2 in. long, including the wing, the body clavate and $\frac{1}{2}$ to $\frac{3}{4}$ in. long.

Sierra Nevada foothills, Sacramento Valley, North Coast Ranges and northward. Rare in South Coast Ranges (Walnut Creek, Gilroy, Pajaro River).

3. *F. dipetala* H. & A. MOUNTAIN ASH. Shrub 5 to 15 ft. high; leaves 2 to 6 in. long; leaflets 3 to 9, serrate above the middle, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; petals 2, white, about 3 lines long; samaras 1 to $1\frac{1}{4}$ in. long, the wing frequently notched at tip.

Cañons or mountain slopes in both the Sierra Nevada and Coast Ranges: Yaca Mts.; Paso Robles, *Benj. Cobb*; and southward. Also called Flowering Ash.

GENTIANACEAE. GENTIAN FAMILY.

Glabrous herbs with a colorless bitter juice. Leaves opposite, simple (or rarely compound), entire. Flowers perfect, regular 5 or 4-merous. Calyx persistent. Corolla usually withering-persistent. Stamens on the tube or throat of the corolla, the lobes of which are commonly convolute. Ovary superior, 1-celled, with 2 parietal placentae; style one or none; stigmas 2. Fruit a 2-valved septicidal capsule, the incurved edges bearing the seeds.

Perennials; flowers blue; anthers remaining straight.....1. GENTIANA.
Annuals.

Flowers red or pink; anthers twisting spirally after shedding pollen.....2. ERYTHRAEA.
Flowers yellow; anthers unchanged.....3. MICROCALA.

1. GENTIANA L. GENTIAN.

Herbs with opposite sessile leaves and showy usually blue flowers. Corolla withering-persistent and enclosing the capsule. Calyx 4 or 5-cleft, commonly with a membranous or spathe-like tube. Corolla campanulate or funnellform, the

lobes 4 or 5 and often with teeth or plaited folds in their sinuses. Style short and persistent, or none; stigmas 2. Capsule oblong, containing very numerous small seeds with a loose cellular or winged coat. (Gentius, king of Illyria, who discovered the tonic properties of these herbs.)

1. *G. oregana* Engelm. Perennial, erect, $1\frac{1}{2}$ to 2 ft. high; leaves ovate or oblong-ovate, 1 to $1\frac{1}{2}$ in. long; flowers few to several at summit of stem; bracts oblong or ovate; calyx-lobes oblong- to ovate-lanceolate, as long as tube; corolla broadly funnelform, almost always 5-merous, $\frac{1}{4}$ to $1\frac{3}{8}$ in. long, the lobes ovate, not narrowed at base; plaits in the sinuses prolonged into conspicuous subulate appendages; capsule more or less stipitate; seed surrounded by a distinct wing.

North Coast Ranges, rare within our limits: Mt. Tamalpais; Pt. Reyes; Pt. Arena and northward to British Columbia. There are at least five other species of Gentian in the Sierra Nevada, mostly alpine or subalpine.

FRASERA Walt., includes perennials with small rotate 4-parted corolla and flattened capsule. *F. NITIDA* Benth., has a pale bluish corolla with a single greenish gland on each lobe.—Sierra Nevada foothills northward; Lake Co. *F. SPECIOSA* Dougl., has 2 glands on each corolla-lobe with a separate crown below them.—Sierra Nevada.

MENYANTHES TRIPOLIATA L., Buck-bean, is an aquatic or marsh plant of the Sierra Nevada, with alternate compound leaves and white or pink flowers in a raceme; it was found near San Francisco in early days by Bigelow and by Behr, but has since become extinct. It should be looked for along the coast northward.

2. ERYTHRAEA L. C. Rich. CANCHALAGUA.

Low erect leafy annuals, mostly freely branching. Flowers red or pink, 5 or sometimes 4-merous, in cymes or cymosely paniculate. Calyx-lobes narrow, carinate. Corolla salverform, the stamens inserted on its throat. Filaments slender, the anthers oblong or linear, twisting spirally after shedding their pollen and commonly exerted. Style filiform, deeiduous; stigmas oblong to fan-shaped. Capsule oblong-ovate to fusiform, 1-celled, but the seed-bearing edges of the valves more or less approximate in the center. Seeds oblong or spherical, reticulate-pitted. (Greek erythros, red, the flowers commonly of that color.)

Anthers oblong; corolla-lobes $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.....1. *E. muhlenbergii*.
Anthers linear; corolla-lobes $3\frac{3}{4}$ to 4 lines long.....2. *E. trichantha*.

1. *E. muhlenbergii* Griseb. Two or 3 to 9 in. high; leaves oblong, the floral lanceolate; inflorescence sparsely paniculate; flowers in the forks with short pedicels or hardly any; lateral flowers with pedicels often as long as the flower and with 2 bractlets at summit; corolla-lobes oval, obtuse or retuse, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long; anthers oblong; seeds short-oval.

Rather common in the Bay region and southward to the Mojave Desert.

2. *E. trichantha* Griseb. Nine in. high or less; leaves narrowly ovate to oblong-lanceolate, $1\frac{1}{2}$ in. long or less; inflorescence densely cymose; corolla-lobes $3\frac{1}{4}$ to 4 lines long, very much shorter than the tube, oblong, acute at apex but at length involute and therefore seeming acuminate; anthers linear; stigmas small.

Coast Range valleys at Calistoga and elsewhere southward to Monterey. Valued by the Spanish-Californians in its fresh state in the treatment of ague, the effective medicinal properties said to be lost in drying.

3. MICROCALA Hoffmegg. & Link.

Almost minute annual. Stem simple, or with peduncle-like branches terminating in a 4-merous yellow flower. Calyx 4-toothed. Corolla short-salverform, the

4 short stamens inserted on its throat. Anthers cordate-ovate and unchanged after anthesis. Stigma of 2 fan-shaped lobes which at length separate. (Greek mikros, small, and kalos, beautiful.)

1. **M. quadrangularis** (Lam.) Griseb. Commonly 1 to 2 in. high, with 1 to 3 pairs of oval or oblong leaves below, these $1\frac{1}{2}$ to 3 lines long; peduncle naked, quadrangular; calyx short, strongly quadrangular, and seeming as if truncate at base and apex, especially in fruit, when it is 2 to $2\frac{1}{2}$ lines long; corolla deep yellow, the lower half membranous, twice as long as the calyx, open under a sunny sky, closing in afternoon.

Level or moist country in the neighborhood of low hills, or in open woods, mostly of the outer Coast Ranges: Mendocino Co. southward to Oakland and San Francisco. Thought by some not to be a native plant.

APOCYNACEAE. DOGBANE FAMILY.

Ours perennial herbs with milky juice. Leaves simple, entire and opposite. Flowers complete, regular, 5-merous except the pistils which are 2. Calyx nearly free from the ovaries, imbricated in the bud and persistent. Corolla-lobes convolute in the bud. Stamens borne on the corolla alternate with its lobes; anthers produced at base into a sterile appendage, connivent around the stigma. Ovaries 2 and distinct (though their styles and stigmas are united into one), both developing into follicles. Seeds in ours with a silky tuft of hairs at the end (coma); embryo large, straight, in scanty albumen. An order closely allied to the milkweeds.

VINCA MAJOR L., Common Periwinkle, an escape near gardens, particularly along stream banks, and known in California chiefly under the erroneous name of 'Myrtle,' is a trailing herb with blue flowers, naked corolla-tube and naked seeds.

Calyx-tube adnate to back of ovaries below; style very short.....1. APOCYNUM.
Calyx wholly free; style long and filiform.....2. CYCLADENTIA.

1. APOCYNUM L. INDIAN HEMP.

Flowers small, in terminal cymes. Calyx small, deeply 5-cleft, its tube by means of a disk adnate to the back of the ovaries below. Corolla campanulate, 5-lobed, bearing 5 small triangular-subulate appendages alternate with the stamens. Stamens borne at base of corolla; filaments short and broad; anthers sagittate, acute. Style very short or hardly any; stigma ovoid, obscurely 2-lobed. Follicles 2 to 7 in. long, slender, pointed, terete. Seeds numerous, flattish. (Greek apo, from, and kuon, dog, ancient name of the Dogbane.)

Low pubescent herb; corolla pinkish white.....1. *A. androsaemifolium*.
Tall glabrous yellowish green herb; corolla greenish.....2. *A. cannabinum*.

1. **A. androsaemifolium** L. var. **pumilum** Gray. Diffusely branched, 7 to 12 in. high, finely pubescent; leaves ovate to oval, or some lowermost orbicular, varying from obtuse to cordate at base, $\frac{3}{4}$ to 1 in. long, on short petioles; flowers solitary in the upper axils, and in short cymose clusters at the ends of the branches; corolla pinkish white, subcylindric, 2 lines long or over, its lobes broadly oblong, its tube much exceeding the lanceolate calyx-lobes.

Mt. Diablo; St. Helena; northward to Mt. Shasta. June.

2. **A. cannabinum** L. COMMON INDIAN HEMP. Stems erect, 2 to 4 ft. high, rather strict; herbage of a light almost yellowish green, glabrous; leaves oval to oblong-ovate or lanceolate, sessile or short-petioled; corolla greenish, $1\frac{1}{2}$ lines long or less, its segments not surpassing the calyx-lobes.

Stream and river-banks, widely distributed but more common toward the in-

terior. North Coast Ranges; Sacramento and San Joaquin rivers; Sierra Nevada. May-July. Poisonous to cattle.

2. CYCLADENIA Benth.

Stems simple, one to many from a large fleshy root, bearing 2 or 3 pairs of leaves and 2 or 3 axillary peduncles with 2 or 3 rose-purple flowers on slender pedicels. Calyx parted into 5 slender lobes. Corolla funnelform with 5 broadly oblong or roundish lobes and 5 minute appendages alternate with the lobes, one behind each stamen. Stamens borne on the tube. Style long and filiform, with a conspicuous membranous ring under the stigma. Disk an entire cup surrounding the base of the ovaries. (Greek kuklos, a ring, and aden, a gland, referring to the disk.)

1. *C. humilis* Benth. Three to 6 in. high, glabrous; leaves thickish, ovate or roundish, petioled, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long; corolla about $\frac{3}{4}$ in. long; pedicels about 7 lines long; follicles 3 in. long.

High montane on gravelly ridges (about 6,000 ft.): Santa Lucia Peak; Cobb Mt.; Snow Mt., and northward; Sierra Nevada. June-July.

ASCLEPIADACEAE. MILKWEED FAMILY.

Herbs with milky juice. Leaves opposite or whorled. Flowers cymose, regular, with the stamens and the divisions of the corolla and calyx 5. Pistils 2, with distinct superior ovaries; styles distinct below but united above into a short-cylindric styler disk, and surrounded by the stamens which are attached to it. Between each anther, on the sides of the styler organ, is a cloven gland or elevated ridge slit longitudinally. Pollen-grains in each cell united into waxy pear-shaped masses which are stalked and suspended in pairs from the summit of cloven glands, each pair of stalks deriving its pollen-masses, not from the cells of one anther, but from contiguous anther-cells of different anthers. Pollination entomophilous; the foot of the insect is caught in the slit, and when drawn upward, drags out and bears away the pollen-masses; in walking over other flowers, the insect's foot is again drawn through a slit, and the pollen-masses are left behind on the stigma, which is concealed beneath the cloven structure. Fruit of 2 follicles. Seeds with a silky tuft of hairs at the micropyle.

Stems terete, erect1. ASCLEPIAS.
Stems strongly flattened, prostrate.....2. SOLANOA.

1. ASCLEPIAS L. MILKWEED.

Perennial herbs with thick deep-seated roots. Stems strictly erect. Peduncles of the simple umbels generally placed between the opposite leaves, but nearer one than the other. Bracts of the involucre usually subulate. Calyx and corolla 5-parted, the divisions reflexed, those of the former small, persistent, those of the latter deciduous. Stamens 5, inserted on the base of the corolla, the filaments united into a tube which is blended above with the styler column and bears a circle of 5 hoods, each containing an incurved horn, or hornless. Follicles ovate or lanceolate, one often abortive. Seeds anatropous, flat, margined, imbricated on the large placenta. Embryo large, with broad foliaceous cotyledons in thin albumen. (Greek name of the European Swallow-wort, a plant of this family.)

Hoods of the stamens with an incurved horn or crest projecting from or contained within the cavity.

Herbage glabrous; leaves mostly in whorls of 3 to 6, linear or linear-lanceolate; umbels on peduncles longer than the pedicels.....1. *A. mexicana*.

Herbage hoary-tomentose; leaves broad.

Umbels on peduncles longer than the pedicels.

Hoods twice as long as the stamen-column; corolla purplish; leaves opposite.... 2. *A. speciosa*.

Hoods not exceeding the column; corolla creamy-white; some of the leaves in whorls of 3 or 4..... 3. *A. eriocarpa*.

Lateral umbels sessile, the terminal one peduncled; hoods not exceeding the column; leaves all opposite..... 4. *A. vestita*.

No horns to the hoods of the stamens.

Hoods conical, open down the front, a little exceeding the anthers; herbage glabrous, greenish or purplish..... 5. *A. cordifolia*.

Hoods pointless, lower than the anthers, cleft half-way down the back; herbage white-tomentose..... 6. *A. californica*.

1. **A. mexicana** Cav. NARROW-LEAF MILKWEED. Stem slender, about 2 ft. high; herbage glabrous; leaves linear to linear-lanceolate, in whorls of 3 to 6, or the lower and uppermost opposite, $2\frac{1}{2}$ to 6 in. long, 2 to 6 lines broad, short-petioled; umbels many, often in whorls or corymbose, densely many-flowered, on peduncles longer than the pedicels; flowers small, greenish white or tinged with purple; corolla-lobes oblong, 2 lines long; horns slender, subulate, exserted from the hood and incurved over the summit of the disk; follicles 3 or 4 in. long, about 4 lines thick at the widest part; seeds $3\frac{1}{2}$ lines long.

Forming patches in dry ground, common and widely distributed in barren valley fields: Sacramento and San Joaquin valleys; Coast Ranges but not immediately on coast within our limits, or rare; Southern California. July- Sept. Said to poison cattle.

2. **A. speciosa** Torr. CREEK MILKWEED. Stem stout, 2 to $4\frac{1}{2}$ ft. high, leafy to the top; soft-tomentose, or rarely glabrate in age; leaves opposite, oval to ovate or oblong, transversely veined, acute or obtuse, 4 to $5\frac{1}{2}$ in. long; petioles 3 to 5 lines long; peduncle longer than the woolly pedicels; lower umbels with 6 to 10 flowers, the upper with 18 or 20 to as many as 55; petals pink or reddish purple; hoods with a short involute base, above this abruptly contracted into a nearly flat lanceolate portion, the whole fully twice as long as the stamen-column; horns much exserted, incurved over the central disk; follicles soft-spiny, at least toward the apex.

Dry flats of cañon bottoms or along streams: Sacramento Valley and south nearly to Haywards, *W. W. Carruth*; common in the Sierra Nevada and east to the Rocky Mts. May-Aug. More or less poisonous.

3. **A. eriocarpa** Benth. Stem $1\frac{1}{2}$ to 3 ft. high, more or less sharply angled below; herbage hoary-tomentose, in age more or less deciduous; some of the leaves in whorls of 3 or 4, all broadly oblong with truncate base, rounded or acute at apex, 5 to 7 in. long, short-petioled; umbels few or several, mostly corymbose-clustered toward the summit, on peduncles equaling or rather longer than the pedicels; flowers $3\frac{1}{2}$ lines long; corolla creamy-white; hoods with slight purplish tinge, shorter than the anthers, cleft a short distance down the back, the acute sickle-shaped horn little protruded from between the acute teeth of the cleft.

Dry ground: Mendocino and Lake cos. and southward through the Coast Ranges to Southern California. July-Aug. Said to poison sheep.

4. **A. vestita** Torr. Similar to no. 3; umbels 1 or 2; peduncles not longer than the pedicels; hoods nearly erect, equaling the anthers, rather evenly truncate; horn broad, its apex subulate, inflexed and a little exserted.—Upper Sacramento westward to Mendocino Co.

5. **A. vestita** H. & A. WOOLLY MILKWEED. Stem unbranched, $2\frac{1}{2}$ to 3 ft. high; white-woolly, at length densely floccose; leaves opposite, ovate to oblong-lanceolate, the upper more acuminate and often subcordate at base, short-

petioled or the upper sessile, 4 to 6 in. long; umbels 1 to 4, the lateral sessile, the terminal peduncled; corolla greenish white or purplish, tomentose on the outside, its lobes 3 lines long; hoods truncate at summit and entire, not exceeding the stamen-column; horn or crest blunt, not exerted, attached to the hood.

Southern California: southern Sierra Nevada foothills; near San Francisco and Monterey acc. to Bot. Cal.

5. **A. cordifolia** (Benth.) Jepson. PURPLE MILKWEED. Stems $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; herbage green and more or less purplish, perfectly glabrous; leaves mostly opposite, rarely in 3s, ovate-lanceolate, with the lower round or elliptic-ovate, the upper ovate to ovate-lanceolate with cordate-clasping base, 2 to 4 in. long; umbels loosely many-flowered, mostly in the axils of bracts at the naked summit of the stem, the filiform pedicels equaling or shorter than the peduncles; corolla dark-red purple, its lobes 3 or 4 lines long; hoods purplish, oblong, the summit obliquely truncate dorsally and produced at the ventral margins into an ascending cusp, the fissure down the front narrow; foliicles glabrous, 2 to 5 in. long, often long-attenuate.—(*Gomphocarpus cordifolius* Benth.)

North Coast Ranges at middle altitudes (Vaca Mts., Napa Range, etc.); Sierra Nevada.

6. **A. californica** Greene. Vegetative aspect of *A. vestita* but commonly stouter and lower; leaves opposite, ovate or broadly oblong, 4 in. long somewhat more or less, sharply acuminate, dark green and shining beneath the tomentum; umbels nearly sessile, about 6 to 8-flowered; corolla purplish; hoods dark maroon, nearly orbicular, laterally compressed, centrally attached and reaching nearly to the middle of the anthers, 2-cleft half-way down the back and destitute of horn.—(*Gomphocarpus tomentosus* Gray.)

Antioch; Pine Cañon, Mt. Diablo, *W. W. Carruth*; Southern California. Apr.-May.

2. SOLANOA Greene.

Perennial herb with strongly flattened stems and opposite leaves. Umbels small, terminal, globose, densely many-flowered, the peduncles longer than the pedicels. Flowers purplish red outside, flesh-color within. Hoods cleft dorsally from top to bottom. Horns none. (The Indian chief, Solano, of the Suisunes.)

1. **S. purpurascens** (Gray) Greene. Stems 2 or 3 from a stout taproot, about 1 ft. long, prostrate, flexuous, purplish and purple-dotted; herbage canescently-puberulent; leaves thick, the lowermost elliptic-ovate, the upper broadly cordate-ovate, 1 to 2 in. long; umbels 2; flowers purplish red outside, flesh-color within, about 2 lines long; foliicles 2 in. long, about 5 lines in diameter at the widest part.—(*Gomphocarpus purpurascens* and *Schizonotus purpurascens* Gray.)

High montane dry or rocky slopes in the North Coast Ranges: the Geysers, Sonoma Co., *Towle*; Snow Mt., *Brandege*; Fout's Springs, *Rattan*; Soldiers' Ridge, Yalho Bally Mts., *Jepson*. The only recorded stations.

CONVOLVULACEAE. MORNING-GLORY FAMILY.

Chiefly twining or trailing herbs. Leaves alternate, or the plants leafless parasites. Flowers complete and perfect. Sepals 5, distinct or nearly so, imbricated, persistent, often unequal. Corolla regular, usually showy, more or less campanulate, mostly shallowly 5-lobed, commonly folded longitudinally and twisted in the bud. Stamens 5, borne on the base of the corolla. Ovary superior,

2 (rarely 1) -celled, with 2 ovules in each cell. Styles 1 or 2. Fruit most frequently a capsule, 1 to 4 (or 6) -seeded. Embryo with folded cotyledons.

Ovary 2-parted; styles 2, distinct or united at base only; creeping herbs; corolla-lobes imbricate in the bud.....1. *DICHONDRA*.

Ovary entire.

Style 1, entire or cleft at the apex only; corolla plicate and twisted in the bud; prostrate or twining herbs, one species woody.....2. *CONVOLVULUS*.

Style 2, distinct; corolla-lobes imbricate in the bud.

Erect non-twining leafy herb.....3. *CRESSA*.

Leafless twining parasites.....4. *CUSCUTA*.

1. *DICHONDRA* Forst.

Perennial herbs with slender creeping stems and very small obscure flowers near the surface of the ground. Leaves reniform, entire, with very short 1-flowered peduncles in the axils. Calyx 5-parted. Corolla 5-cleft, the lobes imbricated in the bud. Stamens short. Ovary 2-lobed, separating when ripe into 2 one-seeded utricles which sometimes break open irregularly. Cotyledons linear, entire. (Greek, *di*, double, and *chondra*, grain, on account of the deeply parted and twin fruit.)

1. *D. repens* Forst. Stems whitish pubescent, rooting freely; leaves green and mostly glabrous, $\frac{1}{2}$ to $1\frac{1}{2}$ in. wide, on long peduncles with 2 small bracts at base; calyx thinnish, 1 to $1\frac{1}{2}$ lines long; corolla purple, edged with white, of about the same length; ovary densely white hairy; styles united at base.

Mt. Tamalpais; San Francisco; Monterey. Introduced from the southward or from the tropics. Also at San Diego. Apr.

2. *CONVOLVULUS* L. BINDWEED. MORNING-GLORY.

Twining or prostrate herbs, ours perennial except one. Corolla funnellform to campanulate. Style entire, or cleft at the apex only. Stigmas ovate to linear. Stamens included. Capsule globose with 4 seeds in 2 cells (or by abortion 1-celled), mostly 2 to 4-valved. (Latin *convolvere*, to entwine.)

Flowers showy, 1 to 2 in. long; perennials.

Calyx subtended by a pair of bracts; peduncles 1-flowered.

Corolla pink, purple, or lavender; calyx enclosed by the broad bracts.

Leaves reniform, glabrous; slightly succulent seaside herb.....1. *C. soldanella*.

Leaves ovate-lanceolate, sagittate at base, acuminate at apex, 2 in. long, sparsely hirsute; bracts cordate at base.....2. *C. sepium*.

Corolla white or creamish; calyx embraced by the smallish bracts; leaves ovoid or deltoid, sagittate, mostly 1 in. long; trailing or often nearly acaulescent.

Herbage white with a velvety tomentum.....3. *C. villosus*.

Herbage green.....4. *C. subcaulis*.

Calyx with the narrow bracts more or less distant; peduncles often more than 1-flowered; leaves sagittate.

Stems climbing over shrubs and trees, woody below; bracts situated about their own length from the calyx.....5. *C. luteolus*.

Stems herbaceous, prostrate; bracts near the middle of the peduncle.....6. *C. arvensis*.

Flowers small, 3 lines long; leaves not sagittate; annual.....7. *C. pentapetaloides*.

1. *C. soldanella* L. SHORE MORNING-GLORY. Stems prostrate, $\frac{3}{4}$ to $1\frac{1}{2}$ ft. long; herbage glabrous and slightly succulent; leaves thick, reniform, deep green and shining, 1 to 2 in. broad, mostly broader than long, on stout petioles; corolla short and rather broadly funnellform, $1\frac{1}{2}$ to 2 in. broad, pinkish or pale purple; capsule becoming 1-celled.

Sandy beaches of the seashore: San Francisco and north and south along the coast. Apr.-June.

2. *C. sepium* L. HEDGE BINDWEED. Stems from a slender horizontal root-stock, often several ft. long, climbing on herbaceous plants or trailing; herbage nearly glabrous; leaves ovate-lanceolate, acuminate at apex, hastate at base,

2 to 3 in. long, on slender petioles shorter than the blade; peduncles longer than the leaves, 1-flowered; bracts ovate, cordate at base, completely enclosing the calyx; corolla pinkish, 1 to 2 in. long.

3. *C. villosus* (Kell.) Gray. WOOLLY MORNING-GLORY. Similar to the next in habit and equally variable, the whole plant white with a dense velvety tomentum; leaves sharply triangular or ovoid, sagittate, the lobes entire or shallowly sinuate; peduncles 1-flowered, often flexuous or curved, especially in age; corolla funnelform, creamy white, $1\frac{1}{2}$ in. long or less.

High dry slopes and ridges of the coast ranges: Monterey; Mt. Diablo; Napa Range and northward to Mt. Shasta. Sierra Nevada. May-June.

4. *C. subacaulis* (H. & A.) Greene. Stems 1 to 15 in. long, when short erect, when longer trailing, or frequently acaulescent; leaves thin, hirsutulous with somewhat appressed hairs, ovoid or deltoid, hastate or truncate at base, mostly 1 in. long; peduncles 1-flowered, $\frac{1}{4}$ to 1 in. long; bracts smallish, embracing but not enclosing the calyx; corolla campanulate-funnelform, angularly 5-lobed, $1\frac{1}{2}$ to 2 in. broad, white or creamish, with purplish exterior.

Dry hills from the Vaca Mts. and Napa Range to Monterey and southward. Apr.-June.

5. *C. luteolus* Gray. Climbing over trees and shrubs 5 to 20 ft. in height, the stems woody below; leaves glabrous and glaucous, 1 to 2 in. long, sagittate at base, the upper portion or terminal lobe varying from triangular to narrowly lanceolate; basal lobes large, very variable, sometimes nearly as large as the terminal lobe, angular, shallowly 2-lobed or somewhat saliently and acutely lobed; peduncles 1 to 5, commonly 1 to 3-flowered, 2 to 5 in. long; bracts subulate-lanceolate or oblong and acute, distant their length to $\frac{1}{4}$ their length from the calyx; corolla open-funnelform, white, the exposed portion of the folds purplish, 1 to $1\frac{1}{2}$ in. long; limb not lobed, scarcely angular; capsule 1-celled.

Common throughout the Coast Ranges and Sierra Nevada foothills. Apr.-June; or near the coast flowering until Nov. Passing into *C. occidentalis* Gray of southern California in which the bracts are larger and enclose the calyx. Var. *SOLANENSIS* Jepson. Largest leaves $2\frac{1}{4}$ in. broad, almost triangular, the lateral margins from the outer angle of the lobes to the apex nearly straight; basal lobes shallowly sinuate.—Vaca Mts. Var. *PURPURATUS* Greene. Limb of corolla rose-purple, sometimes varying to white on the same plant.—Angel Island; Marin Co.; San Francisco.

6. *C. arvensis* L. ORCHARD MORNING-GLORY. Stems prostrate, 1 to several ft. long, from roots which descend to great depth; minutely villous-pubescent or almost glabrous; leaves oblong- or triangular-sagittate, $\frac{1}{2}$ to 1 or 2 in. long, on petioles $\frac{1}{2}$ as long; peduncles 1 (sometimes 2 or 3)-flowered, with a pair of subulate or spatulate bracts near the middle; corolla white, purplish outside, neither lobed nor angled, 1 to $1\frac{1}{2}$ in. broad.

The most troublesome orchard and garden weed yet naturalized in California, especially obnoxious in the richest and moistest alluvial loams. Native of Europe. May-Oct.

7. *C. pentapetaloides* L. Diffusely branched from the base, the branches 6 to 18 in. long; puberulent or hairy; leaves linear or oblong-oblanccolate, narrowed to a petiole, 1 to 3 in. long; peduncles with a pair of small spatulate or subulate bracts below the flower, 1-flowered, retrocurved in fruit, $\frac{1}{2}$ to 1 in. long; sepals more or less hairy with subscarios margin; corolla purplish, 3 lines long, deeply 5-left.

Naturalized from Europe: lower San Joaquin Valley; Antioch; Estrella.

3. *CRESSA* L.

Low canescent perennial herb with erect or diffuse non-twining stems. Sepals nearly equal. Corolla white, its tube oblong-campanulate, equaling the sepals; limb 5-parted into lightly convolute-imbricate lobes which are somewhat induplicate in the bud. Filaments filiform, exserted from the throat of the corolla; ovary 2-celled, 4-ovuled. Capsule by abortion often 1-seeded. (Greek *Kressa*, a Cretan woman.)

1. *C. cretica* L. Commonly densely branched from the base, forming low tufted plants 3 to 6 in. high; leaves oblong-ovate, 2 to 4 or 5 lines long, almost sessile; flowers short-pedicel in the axils; sepals oblong-ovate, acute, 2 lines long; corolla-lobes oblong-ovate; ovary long-hairy.

Alkaline lands from the Sacramento Valley southward, especially common in the San Joaquin Valley, often covering thousands of acres. May. This plant and several others of the interior plains, such as *Sida hederacea* and *Distichlis spicata*, indicate a high percentage of alkali salts in the soils where they grow.

4. *CUSCUTA* L. DODDER.

Annual leafless parasites, destitute of green color, with twining filiform stems. Flowers small, in lateral heads or clusters. Calyx colored like the corolla, deeply 5-cleft. Corolla campanulate or somewhat urn-shaped to short-tubular, with 5 lobes imbricated in the bud, and as many small scales or appendages inserted in the tube below the stamens, or none. Ovary globular, 2-celled, 4-ovuled. Styles 2, in ours distinct, persistent; stigma globose. Capsule 1 to 4-seeded, ours indehiscent. Embryo devoid of cotyledons. The germinating seed produces a twining stem; this becomes parasitic by means of suckers which penetrate the bark of the host. (Derivation doubtful.)

Capsule pointed or conical; corolla-tube with fimbriate scales.

- Corolla-lobes $\frac{1}{2}$ as long as the cylindrical tube.....1. *C. subinclusa*.
 Corolla-lobes as long as the shallow-campanulate tube.....2. *C. salina*.
 Capsule depressed-globose.
 Flowers in dense globose clusters; scales present.....3. *C. arvensis*.
 Flowers in loose cymes; scales none.....4. *C. californica*.

1. *C. subinclusa* Dur. & Hilg. Stems commonly stout; flowers $2\frac{1}{2}$ to 3 lines long, sessile or short-pedicel, at length in large dense clusters $\frac{1}{2}$ to $1\frac{1}{2}$ in. thick; calyx-lobes overlapping, ovate-lanceolate, about $\frac{1}{2}$ the length of the cylindrical corolla-tube; corolla-lobes ovate-lanceolate, minutely crenulate, scarcely more than $\frac{1}{2}$ the length of the tube; anthers oblong or oval, nearly sessile; scales narrow, fimbriate, opposite the stamens but reaching only to the middle of the tube; styles slender, mostly longer than the ovary; ovary capped by the withered corolla.

Very common on Poison Oak and other shrubs and herbs, often occurring on willows and making thick tangles 1 to 2 ft. across. Calyx sometimes reddish; lobes of the corolla mostly erect; tube sometimes narrowed above.

2. *C. salina* Engelm. MARSH DODDER. Stems slender; flowers $1\frac{1}{2}$ lines long; calyx-lobes ovate-lanceolate, as long as the shallow-campanulate tube of the corolla and as the corolla-lobes; these ovate, denticulate, overlapping; filaments about as long as the oval anthers; scales fringed, mostly shorter than the tube, sometimes much reduced and on the base of the tube; styles equaling or shorter than the ovary; capsule surrounded by the withered corolla, mostly 1-seeded.

Very abundant on Salicornia and other saline herbs, entangling them with

its webs of thread-like stems, which in spring color the salt marshes with small patches of gold. July-Sept.

3. *C. arvensis* Beyrich. Stems pale; flowers in dense globose clusters $\frac{1}{2}$ in. thick; calyx-lobes obtuse, broad; corolla 1 line long, with acuminate lobes and short and broad tube, in age remaining at base of capsule; scales deeply fringed.

Alvarado marshes, on Cocklebur.

4. *C. californica* Choisy. Stems capillary; flowers small, 1 to $1\frac{1}{2}$ lines long, in loose cymes; pedicels frequently much thickened below the flower; calyx-lobes with short-attenuate spreading tips; corolla-lobes lanceolate-subulate, equaling or longer than the campanulate tube, mostly reflexed in anthesis; scales none, sometimes represented by inverted arches or V-shaped thickenings alternating with the stamens, but situated near the base of the tube; anthers linear-oblong, nearly or quite equaled by the filaments; styles slender, mostly longer than the ovary; capsule depressed-globose, mostly 2 or 3-seeded.

On Erigonum, Adenostoma, etc. Infrequent in the Bay region. San Francisco, N. L. Gardner.

POLEMONIACEAE. GILIA FAMILY.

Herbs, or a few species slightly suffrutescent. Leaves alternate or opposite, entire, lobed or divided. Flowers complete, 5-merous, either solitary, in loose clusters, capitate, racemose, corymbose or paniculate. Calyx persistent, in one subgenus irregular. Corolla regular, convolute in the bud. Stamens 5, inserted on corolla, alternate with its lobes, often unequal in length. Ovary superior, 3-celled; style 3-cleft or with 3 stigmas. Capsule loculicidally 3-valved. One species of Gilia has a 4-merous corolla and some exceptions as to the capsule are noted under that genus.

Calyx herbaceous throughout; filaments hairy at base; leaves alternate, pinnate.....

1. POLEMONIUM.

Calyx more or less scarious below the sinuses, at least not herbaceous throughout.

Sinuses of the calyx in age distended into a revolute lobe.....2. COLLOMIA.

Sinuses of the calyx not distended.

Leaves alternate in ours except one species, entire or pinnately toothed, lobed or divided3. GILIA.

Leaves opposite, palmately divided in ours, rarely entire.....4. LINANTHUS.

1. POLEMONIUM L. JACOB'S LADDER.

Ours perennials. Leaves alternate, pinnate, the leaflets sessile. Flowers showy, blue or white, in racemes, thyrses or panicles. Calyx herbaceous throughout, not scarious below the sinuses, accrescent. Corolla from funnelform to nearly rotate. Filaments more or less declined and hairy at base. Seeds few or several in each cell. (Greek name used by Dioscorides, from polemos, war, the application not obvious.)

1. *P. carneum* Gray. Stems lax or diffusely branching, 1 to 2 ft. high; herbage lightly pubescent; leaflets thin, 7 to 17, ovate to ovate-lanceolate, 1 to $1\frac{1}{4}$ in. long, distinct or the terminal sometimes confluent; flowers corymbose-paniculate on rather slender pedicels; calyx about 4 lines long, accrescent in age and twice as long; corolla broadly funnelform, salmon-color to purple, 8 to 12 lines long, the limb nearly as broad when expanded; lobes obovate and either acute or obtuse; stamens and style included; seeds 3 or 4 in each cell.

Rare but handsome species of mountain woods: San Mateo Co.; Marin Co.; northward to Siskiyou Co. Apr-May.

P. CONFERTUM Gray. Nine to 12 in. high; herbage glandular-viscid; radical

leaves in a dense tuft; leaflets numerous and crowded, palmately 3 to 5-parted into small divisions; flowers capitate or spicate; corolla blue (or white), 9 to 10 lines long.—Rocky summits of the high peaks of the Sierra Nevada.

2. COLLOMIA Nutt.

Herbs, ours annuals with alternate leaves. Flowers in ours in dense clusters with foliaceous bracts. Calyx turbinate, in age obpyramidal or cup-shaped, its teeth or lobes equal, entire, erect, the sinuses in age distended into a recurved lobe. Corolla narrowly funnelform or salverform, salmon-yellow, reddish, purple, or white. Stamens unequal and unequally inserted on the tube of the corolla, mostly straight. Seed 1 in each cell, the seed-coat developing spiral threads when wet. Capsule oval to obovoid. (Greek kolla, glue, on account of the mucilaginous seeds.)

Corolla narrowly funnelform, pale salmon-color; leaves entire.....1. *C. grandiflora*.
Corolla salverform, red-purple; leaves more or less bipinnatifid or simply toothed or entire2. *C. heterophylla*.

1. *C. grandiflora* Dougl. Erect, simple, $\frac{3}{4}$ to 2 ft. high; leaves alternate, linear or oblong-lanceolate, entire, sessile; flowers crowded in head-like clusters at the ends of the stems and leafy-bracted, or some often borne below, either singly in the axils or in small clusters on short branchlets; calyx-tube obconical, its lobes broad and obtuse; corolla pale salmon-color, narrowly funnelform, 1 in. long, its tube thrice as long as the calyx, its lobes broadly oblong; valves of the capsule after dehiscence with the sides strongly reflexed.

Common in the Sierra Nevada at middle altitudes; occurring in the Coast Ranges at the higher altitudes, but rarely collected. July.

2. *C. heterophylla* Hook. Low and erect, or diffusely branching and the stems 1 ft. long; herbage more or less viscid-pubescent; leaves thin, the upper entire or toothed, the lower pinnately cleft or pinnately divided and the broad segments laciniately cleft; flowers in small bracted clusters at the ends of the branches; corolla red-purple, small, $\frac{1}{4}$ to $\frac{1}{2}$ lines long, the limb 1 line broad; capsule ellipsoid; seeds 2 or 3 in each cell.

Shady places in the mountains: Coast Ranges (Gilroy, Marin Co., Napa Co.); Sierra Nevada. Mar.-Apr.

3. GILIA R. & P.

Herbs, ours annuals, except *G. densifolia*. Leaves alternate (except *G. gracilis*), pinnately toothed, lobed, or divided, or sometimes entire. Calyx-tube scarious below the sinuses. Corolla funnelform to salverform, blue, yellow, or white, the stamens equally inserted on its throat except a few species. Capsule 3-celled and 3-valved, or (in 2 species of the subgenus *Navarretia*) 1-celled and 4-valved. (Felipe Luis Gil, Spanish botanist of the latter half of the 18th century.)

A. Calyx-segments equal, entire.

Flowers solitary, in loose or capitate clusters, or paniculate, bracted or bractless; stamens equally or unequally inserted on throat of corolla; leaves in ours mostly flaccid, not pungent or prickly.—Subgenus *Eugilia*.

1. *Leaves opposite*.

Leaves entire; corolla salverform, its tube little surpassing calyx, its throat yellow and limb purple1. *G. gracilis*.

2. *Leaves alternate*.

Leaves pinnatifid or pinnately lobed, the upper usually palmately parted into 3 to 5 divisions; corolla funnelform, its tube 2 to 3 times longer than the calyx.....

2. *G. giloides*.

Leaves mostly 1 to 3 times pinnately dissected into narrow segments, not pungent; flower-clusters not bracteate; calyx-teeth equal; corolla funnellform.

Stamens included; flowers few in mostly loose clusters.

Flowers blue or purple; perianth tube of corolla much shorter than calyx; leaves pinnately parted into entire or toothed lobes.....3. *G. multicaulis*.

Flowers 3-colored, blue, purple, and yellow; leaves laciniately bipinnatifid.4. *G. tricolor*.

Stamens more or less obviously exserted; flowers in capitate clusters terminating long peduncles.

Corolla segments obovate or oblong.....5. *G. achilleaeifolia*.

Corolla segments nearly linear.....6. *G. capitata*.

Leaves or their simple divisions linear or filiform and rigid; flowers crowded into capitate leafy-bracted clusters, the calyces and the bracts densely woolly-matted; corolla salverform; stamens exserted.

Annual or biennial, not woody.....7. *G. virgata*.

Woody-based perennial; corolla 6 to 8 lines long.....8. *G. densifolia*.

B. Calyx-segments mostly unequal, entire or some toothed.

Flowers in terminal capitate bracted clusters; corolla tubular-funnelform or salverform, the stamens equally inserted upon it; leaves pinnatifid or the lowest subentire, the segments mostly rigid and subulate or cuspidate.—Subgenus NAVARRERIA.

1. Flowers white (pale blue in no. 11).

Capsule not regularly dehiscent, the walls thin and transparent and closely covering the seeds which are agglutinated into a mass.

Stems erect or spreading.

Leaves bipinnatifid; bracts densely white-tomentose.....9. *G. intertexta*.

Leaves once pinnatifid; sinuses of the calyx white-hairy.....10. *G. leucocephala*.

Primary flower-cluster on a very short stem or stem almost none, the branches radiating from beneath it and prostrate; calyx-segments trifid.....11. *G. prostrata*.

2. Flowers blue (except no. 12).

Capsule regularly dehiscent by valves and releasing the seeds which are free from each other; flowers blue (except no. 12).

Leaves (or some of them) pinnately parted with the divisions incised or parted.

Stamens exserted; capsule 1-celled.

Leaves with innocuous teeth; flowers creamy-white, 4-merous; capsule 2-seeded.....

12. *G. cotulaefolia*.

Leaves with pungent teeth, the terminal leaflet spatulate-dilated; capsule 1-seeded...

13. *G. pubescens*.

Stamens not exserted.

Seeds 8 to 12 in each cell; herbage strongly mephitic-scented.....14. *G. squarrosa*.

Seeds 4 in each cell; herbage honey-scented.....15. *G. mellita*.

Leaves merely pinnatifid or incised or many of them entire.

Capsule several-seeded.

Erect slender plants; bractlets laciniately cleft, especially toward the base.....

16. *G. heterodoxa*.

Low very rigid and spiny plants; bractlets dilated and with strong marginal spines...

17. *G. atractyloides*.

Capsule with 1-seeded cells; corolla 6 or 7 lines long; bractlets, especially the inner ones, lanceolate-cleft at apex.....18. *G. viscidula*.

1. *G. gracilis* Hook. Simple or branched above, 3 to 8 in. high; herbage pilose-pubescent, the hairs often gland-tipped; leaves opposite, oblong to lanceolate, entire; inflorescence cymose and terminal; calyx cylindrical, 3 or 4 lines long, much distended in fruit by the globose capsule, the short teeth accrescent; tube of corolla yellow, surpassing the calyx, the limb 1 to 1½ lines broad, its lobes roundish, emarginate; stamens unequally inserted; seeds 1 in each cell, with a rather broad thin margin.—(*Collomia gracilis* Dougl.)

Inconspicuous but rather common on low hills of the Coast Ranges and in the Sierra Nevada foothills. Mar.-Apr.

2. *G. gilioides* (Benth.) Greene. Loosely branching, erect or diffuse, 8 to 20 in. high; radical and lower leaves pinnately parted into narrowly oblong or lanceolate divisions, or all so divided, or the upper palmately divided into 3 to 5 obovate or lanceolate divisions; corolla 4 to 6 lines long, salverform, blue-purple; stamens unequally inserted; capsule globose; seeds 1 or 2 in each cell.—(*Collomia gilioides* Benth.)

Mostly at higher altitudes in the mountains: Coast Ranges; Sierra Nevada; Southern California. June. Leaves exceedingly variable.

3. *G. multicaulis* Benth. Branching from the base, 9 to 14 in. high, glabrous; leaves pinnately parted into 5 to 9 linear and entire or toothed lobes; flowers subsessile or the clusters loose, in either case few-flowered, the pedicels 1 to 4 lines (rarely 1 in.) long; calyx-teeth erect or recurved in fruit; corolla deep or pale blue, its proper tube shorter than the calyx, the funnellform throat longer than the obovate lobes; stamens unequally inserted; capsule ovoid.

Hills and valleys from Marin Co. and the Vaca Mts. southward through the Coast Ranges to Southern California. Variable.

G. LATIFLORA Gray. A similar species, glabrous except the loosely paniculate inflorescence; radical leaves pinnatifid, the cauline few, narrow and entire; pedicels shorter than the flowers or 1 in. or more long; corolla dilated-funnel-form, abruptly contracted below into a narrow tube which slightly exceeds the calyx; calyx less than 2 lines long, with subulate or acute teeth.—Southern California and northward in the South Coast Ranges.

4. *G. tricolor* Benth. BIRD'S EYES. Erect, usually branching somewhat above the base, commonly 4 to 7 in. or sometimes 1 ft. high; herbage more or less pubescent with gland-tipped hairs; leaves laciniately bipinnatifid into narrowly linear divisions; calyx 3 lines long, its lobes acuminate; corolla 6 to 7 lines long, the roundish lobes azure or whitish, the throat with 2 oblong purple areas beneath each lobe bounded below by yellow; stamens inserted at the sinuses.

Common on low hills: Coast Ranges (Los Gatos, northward to Humboldt Co., but especially common toward the interior); Sierra Nevada foothills. Apr. Also called "Pink Eyes" near Vallejo.

5. *G. achilleaefolia* Benth. Very similar to the next in habit but very frequently simple, generally more pubescent, and the capitate flower-clusters larger and less compact; calyx more or less woolly, the teeth triangular, acute, with short recurved tips or connivent over the young fruit; corolla deep or pale blue, funnellform with ample throat, its lobes obovate or oblong.

Sandy soils: Coast Ranges; Sierra Nevada foothills; Southern California. May.

6. *G. capitata* Dougl. Erect, simple or more commonly branching above, 2 or 3 ft. high, pubescent or almost glabrous; leaves several times palmately dissected into linear or filiform lobes, or the uppermost merely pinnately divided; ultimate segments often curved or falcate; peduncles long, slender and naked, terminating in a densely globose (capitate) cluster; calyx nearly or quite glabrous, its teeth lanceolate, in anthesis approximating the tube in length; corolla light blue, its lobes nearly linear; stamens inserted in the very sinuses of the corolla.

Coast Range hills and ridges from Marin and Napa cos. northward; Sierra Nevada. May.

7. *G. virgata* Steud. var. *floribunda* Gray. Stems simple or branching at the base; leaves pinnately parted into 3 to 7 filiform lobes, the middle (or terminal) lobe commonly much longer than the others; flowers numerous in head-like clusters terminating the corymbose branches, the bracts and calyx very densely woolly; corolla salverform, the tube 6 to 8 lines long and surpassing the acerose calyx-lobes; filaments filiform and exserted.

Sandy soils of the valleys: lower San Joaquin plains and Santa Clara Co. southward to Southern California. June-July. *G. VIRGATA* has the lower

leaves entire, the upper rarely more than 3-parted, with the clusters virgately disposed.—Monterey and southward.

8. *G. densifolia* Benth. Perennial; stems numerous from a tufted woody base, 8 to 14 in. high; herbage lanate-tomentose when young, glabrate in age; leaves narrowly linear and entire or with 1 or 2 pairs of short-subulate spinulose lobes at the middle or toward the base; flower-clusters terminal, dense, the foliaceous bracts and the calyces implexed-woolly; four of the calyx-teeth short, the fifth as long as the tube; corolla deep blue, the tube 6 lines long, 2 or 3 times the length of the calyx, its lobes oblong, about 2 lines long.

Mountains of Santa Clara Co. and southward to Southern California. June-Sept.

9. *G. intertexta* Steud. Stems simple or often branching from the base, 2 to 7 in. high, whitish-puberulent but not glandular; leaves bipinnatifid and the segments spinescent-tipped; body of bracts and exterior of calyx-tube densely white-villous or woolly-tomentose; corolla white or pale blue, equaled by the calyx-teeth.

Valleys and low hills: North Coast Ranges (Humboldt Co., Healdsburg, Napa Range); Sacramento and San Joaquin valleys. May-June.

10. *G. leucocephala* Benth. Stems simple or branching from the base, 3 to 5 in. high, whitish-puberulent; leaves pinnately parted, the divisions filiform and entire, sparingly toothed, the rachis broad and often prolonged into an elongated terminal entire division; flowers clear white, 4 lines long; calyx with a tuft of hairs at each sinus, the teeth mostly entire and nearly equal.

Low places in fields and beds of pools where water has stood in winter or early spring, the plants often growing very densely: Sacramento Valley. May-June.

11. *G. prostrata* Gray. Plants glabrous; primary flower-cluster sessile, the branches radiating from beneath it, simple or once forked, terminating in the head-like clusters; leaves pinnatifid, the rachis broad and slender, the segments remote; heads dense, surrounded by foliaceous bracts 1 to 1½ in. long; bractlets not exceeding the white flowers; corolla-lobes oblong; calyx with unequal teeth, the two longer tridentate; calyx-teeth in fruit contracted over the 2-celled capsule; seeds 9 to 11, small; embryo short-cylindrical, the cotyledons about equaling the caulicle in length.

Plains of Sacramento and San Joaquin valleys southward to Los Angeles.

12. *G. cotulaefolia* Steud. Erect, 7 to 13 in. high, finely pubescent; leaves bipinnatifid, the segments innocuous; bracts and calyx slightly hairy or glabrous at the base; flowers creamy-white, commonly 4-merous; calyx-lobes varying from nearly equal and entire to unequal, with the longer variously toothed; capsule 1-celled, 4-valved, dehiscent from the base, 2-seeded; embryo with entire cotyledons.

Valley fields: Alameda Co.; North Coast Ranges; Sacramento Valley.

Var. *nigellaeformis* Jepson, n. comb. Bracts multifid; flowers yellow.—Antioch and elsewhere (*Navarretia nigellaeformis* Greene).

13. *G. pubescens* H. & A. Erect, usually branching above, 8 to 18 in. high, puberulent; leaves pinnately divided with the divisions laciniately lobed; terminal portion of the leaf less deeply divided or merely lacinate-toothed, so that the rachis appears as if spatulate-dilated; 3 calyx-teeth small and entire, 2 longer and toothed; corolla deep blue, 7 or 8 lines long, the throat funnel-form; stamens exserted; capsule 1-celled, 4-valved as in *G. cotulaefolia*; cotyle-

dons of the embryo parted into 3 lobes, the divisions so deep as to give the appearance of 6 cotyledons.

Coast Ranges (Calistoga, Vacaville, etc.); very common in the Sierra Nevada foothills.

14. *G. squarrosa* H. & A. SKUNKWEED. Erect and simple or with many branches from the base, 8 to 14 in. high, pubescent and noxiously glandular; leaves once or twice pinnatifid, the segments lanceolate and often crowded; calyx 6 lines long, very scarious below, the teeth lanceolate and pungent; corolla blue, its tube little or scarcely at all exceeding the teeth; stamens included; seeds many, small; embryo thick.

Common in the Bay region (Monterey Co., San Francisco, Oakland, Berkeley, Napa Valley, etc.), ranging northward to Oregon.

15. *G. mellita* Greene. Diffusely branching from the base, 3 to 6 in. high, the stems very slender, brownish, glandular-puberulent with somewhat whitish hairs; leaves pinnately parted into linear-subulate entire or toothed segments; bracts dilated and laciniately toothed or cleft into narrow divisions, or the middle division ovate, abruptly cuspidate and often entire; heads small, $\frac{1}{2}$ in. broad or less; calyx unequally 5-toothed; corolla minute, not exceeding the calyx, very pale blue; stamens not exerted.

Seemingly very local plant in the region immediately north and south of the bay; Belmont; Calistoga; Vacaville.

16. *G. heterodoxa* Greene. Stems very slender, erect, branching, slightly pubescent, 5 to 11 in. high; internodes long; lower leaves with narrowly linear rachis and many pinnate short-subulate segments; uppermost leaves lanceolate and entire except at the laciniately cleft base; bracts lanceolate to broadly ovate, laciniately-toothed towards the base; calyx-segments entire, nearly equal; corolla blue, with exerted declined stamens; capsule 8 to 14-seeded, the seeds small.

Coast Range hills: Napa and Sonoma cos. to Santa Clara Co. June. Subspecies of the next. The valves of the capsule show a tendency to dehisce from the base.

17. *G. atractylodes* H. & A. Stems stoutish, low and spreading or procumbent, somewhat purplish and villous-pubescent, 2 or 3 to 6 in. long; leaves and bracts rigidly coriaceous, oblong-lanceolate to ovate, 2 to 4 lines broad, the margin armed with subulate or aristate teeth; segments of the calyx moderately or very unequal, ovate to lanceolate, entire, setaceous at apex; corolla narrowly funnelform, purple, 7 to 9 lines long; seeds about 10 in each cell.

Dry hills of the Coast Ranges: Clear Lake southward to Southern California. July. Habit suggesting certain species of *Chorizanthe*.

18. *G. viscidula* H. & A. Erect, 2 or 3 in. high, viscid-pubescent; leaves $1\frac{1}{2}$ in. long or less, narrow, with broad rachis and remote short-subulate lobes; bracts little dilated; corolla rather large, blue-purple, the tube exerted, the limb 2 lines broad, its lobes elliptic; ovules 1 to 4 in each cell.

Plains and bases of low hills, in sandy soil: San Rafael; Walnut Creek; Sonoma; Napa Valley; Sacramento Valley; Sierra Nevada foothills. June. While commonly very dwarfish, it sometimes becomes larger and makes a spreading or subprostrate plant 1 ft. broad.

4. *LINANTHUS* Benth.

Ours low or slender annuals. Leaves opposite, palmately divided to the base into narrowly linear or filiform divisions (almost seeming as if in whorls in

some species), rarely entire, rarely with some uppermost alternate. Flowers scattered or in terminal capitate clusters. Calyx-tube scarious between the ribs or angles, its teeth equal. Corolla subrotate, funnelform, or salverform. Stamens equally inserted on the corolla. Capsule with few to many seeds in each cell. (Greek linon, flax, and anthos, flower.)

A. Stems dichotomously branching; flowers solitary.

1. Flowers subsessile or on short stout pedicels.

Corolla short salverform, white or nearly so, its lobes conspicuously convolute in the bud, 1 in. broad; calyx cylindrical, white-scarious between the ribs.....1. *L. dichotomus*.

2. Flowers on capillary pedicels.

Corolla various; stamens inserted at the throat.

Calyx disposed to be turbinate; flowers white, $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, in a loose panicle; corolla nearly rotate, its tube scarcely any.....2. *L. liniflorus*.

Calyx cylindrical; corolla with distinct tube.

Corolla white, narrowly funnelform, 2 lines broad.....3. *L. pusillus*.

Corolla purplish or bluish, 3 to 5 lines broad.

Corolla funnelform; herbage not glandular4. *L. ambiguus*.

Corolla nearly salverform; glandular-hirsutulous at the nodes.....5. *L. rattanii*.

B. Stems simple, or sometimes branching; flowers in capitate clusters.

Corolla salverform; flowers crowded into leafy-bracted capitate clusters at the ends of the stems or branches; calyx-teeth equal.

Corolla-tube little, if at all, exceeding the lobes.....6. *L. densiflorus*.

Corolla salverform, its tube filiform and elongated, several times the length of the limb.

Corolla much exceeding the bracts.

Corolla twice or scarcely twice the length of the bracts, its lobes 3 to 4 lines long; relatively stout plants7. *L. androsaceus*.

Corolla usually more than twice the length of the bracts; very slender plants.

Lobes of the corolla 2 to 3 lines long; flowers purple, pink or pale yellow.....8. *L. parviflorus*.

Lobes of the corolla 1 line long; flowers golden yellow.....9. *L. acicularis*.

Lobes of the corolla 1 to $1\frac{1}{2}$ lines long; flowers purplish or pinkish.....10. *L. bicolor*.

Corolla commonly not exceeding the bracts; bracts conspicuously hirsute-ciliate; rigid plant11. *L. ciliatus*.

1. *L. dichotomus* Benth. EVENING SNOW. Erect, simple or branching from near the base, 5 to 6 (or 9) in. high; nodes few and internodes very long, twice to many times as long as the leaves; flowers terminal or sessile in the forks; ribs of the calyx prolonged into linear-acerose teeth; corolla salverform, white, its tube equaling the calyx-tube, its lobes strongly convolute in the bud, broadly obovate, crose, the limb 1 in. broad; filaments at the very base enlarged, somewhat winged and more or less hairy; cells of capsule many-seeded; seeds not mucilaginous when wet.—(*Gilia dichotoma* Benth.)

Common on open slopes, mostly on high hills: Coast Ranges; Sierra Nevada foothills; San Joaquin plains; Southern California. Mar.-May. Flowers opening in the late afternoon and closing the next morning.

2. *L. liniflorus* (Benth.) Greene. One ft. high or somewhat more, mostly branching above; leaf-segments $\frac{1}{2}$ to 1 in. long; flowers white, in a diffuse panicle, on slender pedicels $\frac{1}{3}$ to $1\frac{1}{3}$ in. long, corolla with nearly obsolete tube; limb rotate, $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, the obovate lobes naked, with several blue longitudinal lines or veinlets; stamens $\frac{1}{2}$ as long as corolla-lobes; filaments with a densely pilose ring just above the base, the corolla pubescent at their insertion; ovules 6 to 8 in each cell.—(*Gilia liniflora* Benth.)

Plains and foothills: Solano Co.; Stockton; San Mateo Co.; Loma Prieta and southward to Southern California. May-June.

3. *L. pusillus* (Benth.) Greene. Very slender, 3 to 6 in. high; calyx cylindraceous, 1 to $1\frac{1}{2}$ lines long, its teeth as long as the tube; corolla narrowly funnelform or subsalverform, its tube dilated somewhat above the middle, not

exserted from the calyx or very slightly, the lobes seldom exceeding the calyx-lobes, the limb 2 lines broad.—(*Gilia pusilla* Benth.)

Dry hillsides in Chamise, Napa Valley. The corolla after flowering is promptly pushed up by the rapidly growing capsule and the tube contracts in withering, so that the corolla in age frequently has the appearance of being salverform and somewhat exserted. Distinct from *L. FILIPES* (Benth.) Greene, common in the Sierra Nevada foothills, which has a turbinate calyx and a short funnellform corolla with broad limb.

4. *L. ambiguus* (Rattan) Greene. Mostly 3 or 4 in. high; pedicels about 6 lines long; corolla 4 to 6 lines long, nearly 3 times the length of the calyx, not strictly salverform, its tube somewhat or not at all exserted, its brown-purple obconic throat scarcely exceeded by the spreading lobes; limb bluish purple, 4 lines broad; ovules 2 in each cell.—(*Gilia ambigua* Rattan.)

Low hills: Santa Clara Valley and near Livermore. May. Some of the flowers show a glandular black band $\frac{1}{2}$ line in breadth midway of the calyx-tube.

5. *L. rattanii* (Gray) Greene. Ten to 12 in. high, glandular-hirsutulous at the nodes and even the flowers with gland-tipped hairs; pedicels $1\frac{3}{8}$ in. long or less; calyx cylindraceous, in anthesis 1 line long, accrescent in fruit to 2 lines long; corolla nearly salverform, with a long slender tube and short funnel-form throat, the tube 3 to 5 lines long, exserted barely 1 line to exceeding 3 lines, the throat yellow, the limb blue and 3 to 5 lines broad; seeds small, very rugulose, one to each cell or the third cell empty.—(*Gilia rattanii* Gray.)

Santa Cruz Mts., Lake Co. June. Remarkable for the variable development of the corolla-tube, even on the same plant.

6. *L. densiflorus* Benth. Erect, simple, 5 in. to 2 ft. high; divisions of the palmately divided leaves 5 to 11, linear-filiform and rigid, ciliate towards the base and somewhat scabrous on the margins; corolla lilac or white, 1 in. long or less, its tube only equaling or little exceeding the obovate lobes, little if at all exserted beyond the calyx-teeth, its limb $\frac{1}{2}$ in. broad, more or less; seeds 3 in each cell, strongly wrinkled.

Coast Range valleys or higher hills, infrequent: Pt. Reyes; Alameda; Santa Cruz Mts.; Monterey Co. and southward. June.

7. *L. androsaceus* (Benth.) Greene. Stoutish, usually simple, 7 to 11 or 15 in. high, finely tomentose or glabrate; lowest leaves spatulate; bracts ciliate, otherwise nearly glabrous; flowers usually many; corolla lilac, lavender, pink or white, 1 in. long, much exceeding the bracts, the lobes 3 to 4 lines long, the throat dark purple with yellow border, 1 line long; stamens little surpassing the throat of the corolla.

Common everywhere in the Coast Ranges and Sierra Nevada on low hills and at middle altitudes. Apr.

8. *L. parviflorus* (Benth.) Greene. Simple or with few branches from the base, erect, commonly 3 to 6 or 11 in. high, almost glabrous; bracts scabrous or hirsutulous, not ciliate or scarcely so, commonly 3 or 4 lines long; segments of the leaves obovate- or linear-spatulate; corolla purple, pinkish or pale yellow, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, the lobes oval, 2 to 3 lines long or less, tinged with red or brown on the outside, the throat yellow; stamens half or commonly more than half as long as the corolla-limb.—(*Gilia micrantha* Steud.)

The most common species, abundant in open ground in the hill country. It is one of the annuals which figure in the vernal landscape color effects in the Coast Ranges, often occupying extensive slopes of the lower or higher hills

to the exclusion either partially or wholly of other species. Var. *ROSACEUS* Jepson. Much branched from the base; corolla rose-color or white, larger than in the type.—San Francisco sand hills.

9. *L. acicularis* Greene. Only 1 to 4 in. high, very slender, somewhat rigid, less pubescent than *L. parviflorus*; leaf-segments linear-acerose; corolla golden-yellow throughout, its tube slenderly filiform, about 6 lines long, the obovate lobes not exceeding 1 line.

Wooded hills, not common: Oakland Hills; Marin Co.; Napa Valley; Humboldt Co. Apr.-May.

10. *L. bicolor* (Nutt.) Greene. Very near *L. parviflorus* but dwarf, 1 to 3 in. high; leaves and bracts hispidulous-ciliate; limb of corolla very short (1 to 1½ lines long) in proportion to the tube which is 6 to 9 lines long, dull purple or pink with yellow throat.—(*Gilia tenella* Benth.)

Rarely collected, but doubtless overlooked for *L. parviflorus*: Humboldt Co.; Suisun; Marin Co.; Mt. Diablo Range; Loma Prieta and southward to Southern California.

11. *L. ciliatus* (Benth.) Greene. Rigid, 4 or 5 in. (rarely 1 ft.) high; stems finely tomentose, the internodes long; leaves scabrous and hirsute; flowers comparatively few; corolla 6 to 9 lines long, not exceeding or often much exceeding the conspicuously hirsute-ciliate bracts, deep rose-red, often fading white, the lobes 1 line long, seldom more; calyx-lobes acerose.—(*Gilia ciliata* Benth.)

Hills and mountain slopes, among oaks and other trees: Coast Ranges (Napa Co., Mt. Diablo); Sierra Nevada; Southern California.

HYDROPHYLLACEAE. PHACELIA FAMILY.

Herbs or shrubs with opposite or alternate leaves. Flowers complete, regular, 5-merous (except the superior ovary which is 1 or 2-celled), in racemes or spikes (often scorpioid), or capitate, or solitary. Stamens 5, inserted near the base of the corolla, alternate with its lobes, which are imbricate in the bud. Styles 1, often more or less 2-cleft at apex, or 2 and distinct. Fruit a 1-celled capsule or partly or quite 2-celled by the intrusion of the placentae or their union in the axis; valves 2, rarely 4. Seeds few or many. Seed-coat pitted, the cavities regular and honeycomb-like.

A. Herbs.

1. Style 2-cleft at apex.

Flowers not scorpioid; ovary more or less hispid, the placentae expanded and forming a sac-like lining.

Stamens longer than corolla; flowers in head-like clusters; leaves alternate or mainly radical.....1. *HYDROPHYLLUM*.

Stamens shorter than corolla; flowers solitary or in racemes; leaves (at least the lower) opposite.....2. *NEMOPHILA*.

Calyx with a reflexed appendage at each sinus.....3. *ELLISIA*.

Calyx naked at the sinuses.....4. *PHACELIA*.

Flowers in scorpioid spikes or racemes; ovary more or less pubescent, the placentae narrow or thin, projecting more or less into its cavity.....5. *EMMENANTHE*.

Corolla blue, purple or white, deciduous.....6. *ROMANZOFFIA*.

Corolla yellow or cream-color, persistent.....7. *ERIODICTYON*.

2. Style entire.

Flowers in racemes; corolla white; ovary glabrous; leaves mainly radical.....8. *ROMANZOFFIA*.

B. Shrubs.

Flowers in a panicle of scorpioid cymes; styles 2, distinct; leaves alternate, thick.....9. *ERIODICTYON*.

7. *ERIODICTYON*.

1. **HYDROPHYLLUM** L. WATER-LEAF.

Perennial herbs with horizontal rootstocks. Leaves alternate or mainly radical, pinnate or pinnately parted, long-petioled. Flowers in capitate cymes. Calyx without appendages. Corolla campanulate, 5-lobed, the tube with a nectar-bearing grooved appendage opposite each lobe. Stamens exserted, the filaments hairy at the middle. Style filiform, exserted. Capsule 1-celled, 2-valved, 1 to 4-seeded. (Greek hudor, water, and phullon, leaf.)

1. **H. occidentale** Gray. Twelve to 17 in. high; leaves 7 to 12 in. long; leaflets 9 to 15, incised, the terminal ones not distinct; peduncles generally exceeding the leaves, bearing 1 or 2 capitate clusters of bluish flowers.

Mostly high montane: Mt. Diablo; Mendocino Co. and northward; Sierra Nevada.

2. **NEMOPHILA** Nutt.

By HARLEY P. CHANDLER, B. S.

Low annuals. Leaves mostly opposite. Flowers solitary or racemose. Calyx with a reflexed appendage in each sinus (rarely obsolete). Corolla white, blue, purple or variegated, varying in shape from tubular to basin-shaped or almost rotate, with 10 minute internal appendages or scales in pairs between the stamens, at base. Stamens included, inserted at or near base of corolla. Style more or less 2-cleft. Capsule 1-celled. Seeds 2 to 25, usually with a deciduous caruncle. (Greek nemos, grove, and phileo, to love.)

A. Flowers 5 lines or more across.

Leaves (at least the upper) alternate; seeds 4.....1. *N. aurita*.
Leaves mostly opposite; seeds usually 5 or more.

Corolla white, with a dark purple spot at tip of each lobe.....2. *N. maculata*.
Corolla blue or white, without a purple tip to each lobe.....3. *N. menziesii*.

B. Flowers 5 lines or less across.

Corolla tubular or tubular-campanulate, less than $2\frac{1}{2}$ lines across, white or pale blue.

Leaves oblong, 5 to 7-lobed.....4. *N. pedunculata*.

Leaves ovate, about 5-lobed, with upper 3 lobes confluent.....5. *N. parviflora*.

Corolla open-campanulate or basin-shaped, white to deep blue.

Leaves oblong, with 5 to 7 oblong lobes.....6. *N. sepulta*.

Leaves, especially the upper, sometimes alternate, typically with 5 to 9 suborbicular petiolulate lobes, but very diverse.....7. *N. exilis*.

1. **N. aurita** Lindl. CLIMBING NEMOPHILA. Weak and straggling; stems angled or winged, armed with retrorse prickles which enable it to climb over other plants; petioles broadly winged and auriculate-clasping; corolla violet, paler outside, with a short throat constricted below top, and spreading limb.

Shady places in Coast Ranges and Sierra Nevada foothills.

2. **N. maculata** Benth. SPOTTED NEMOPHILA. Branches ascending or decumbent; leaves pinnately parted into 5 to 9 ovate or suborbicular, mostly 1 to 3-lobed divisions, the upper usually with only 3 or 5 entire lobes at tip and cuneately tapering base, or lanceolate and entire; peduncles surpassing the leaves; corolla white, with rows of purple dots radiating from the center to the purple spot at the end of each lobe; scales half free, rolled toward the filaments, ciliate.

Meadows at moderate altitudes in the Sierra Nevada.

3. **N. menziesii** H. & A. COMMON BABY BLUE-EYES. Branches slender to succulent, ascending, more or less hirsute-pubescent; lower leaves $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, pinnately divided into 5 to 9 mostly 2 or 3-lobed divisions; upper leaves less divided; peduncles twice as long as leaves; calyx-lobes 2 to 5 lines long; corolla light to deep blue, basin-shaped, divided about three-fourths of

the way to base, $\frac{1}{2}$ to $1\frac{3}{8}$ in. across, often veined with purple, lighter and often dotted toward center, but seldom hairy; scales from broad and wholly adherent to narrow and part free, often enlarged at tip, lacinate, ciliate, or entire.—(*N. insignis* Benth. *N. intermedia* Bioletti.)

Common in the Sacramento, San Joaquin and Coast Range valley floors in moist places and on moist hillsides. Extremely variable. Var. *ATOMARIA* Chandler. Pale Baby Blue-eyes. More succulent and less pubescent, often nearly glabrous; calyx-lobes shorter and broader; corolla white or pale blue, rather smaller, somewhat more deeply divided, dotted or rarely only veined dark purple or black, hairy at center; scales very narrow or linear, usually hairy, often reduced to a mere line of hairs.—Moist places in the Coast Ranges (*N. atomaria* F. & M. *N. venosa* Jepson is probably one of the many garden forms of this variety escaped from cultivation.)

4. *N. pedunculata* Dougl. Plant prostrate, or among underbrush lax, sparingly pubescent; leaves oblong, 5 to 7-lobed; peduncles shorter than the leaves, strongly deflexed in age, burying the capsules; scales linear, often reduced to hairy lines; style as long as ovary or longer.

Damp places in the Coast Ranges, not common.

N. SPATULATA Coville. Closely related to no. 4, from which it is best distinguished by its leaves; leaves spatulate, 3 to 5-toothed or -lobed at tip, with cuneate base; corolla often with a purple spot at the tip of each lobe and a few dots at the center; scales small and lacinate, or obsolete; style sometimes scarcely evident.—Southern Sierra Nevada.

5. *N. parviflora* Dougl. SMALL-FLOWERED NEMOPHILA. Stems decumbent or ascending, hispid; leaf-lobes sharp; peduncles shorter than leaves, not deflexed in age; scales minute, various, but usually half free and lacinate or ciliate; style as long as the ovary or longer.

Coast Ranges, common. Easily distinguished from the two preceding by the leaves and by the character of the pubescence. Var. *QUERCIFOLIA* Chandler. Oak-leaf Nemophila. Like the species but with softer more spreading pubescence; leaves with rounded lobes and shallower sinuses, the lower of which are scarcely deeper than the upper; peduncles mostly exceeding the leaves.—Southern Sierra Nevada at low altitudes (*N. quercifolia* Eastw.)

6. *N. sepulta* Parish. Usually prostrate; branches often strongly angled or winged; leaves oblong, with 5 to 7 oblong lobes; peduncles deflexed in age; corolla open-campanulate, not hairy at center, whitish, often dotted with blue or purple toward the center; scales linear or reduced to hairy lines.

Coast Ranges and Sierra Nevada. Not common.

N. HUMILIS Eastw. Ascending or decumbent; leaves spatulate, elliptical or lanceolate, shallowly 3 to 5-lobed at tip or entire; peduncles not deflexed in age; corolla open-campanulate, whitish, often hairy and dotted with blue or purple toward center; scales from broad and half free to mere hairy lines.—Sierra Nevada. Not common.

7. *N. exilis* Eastw. SMALL WHITE NEMOPHILA. Erect, ascending, or lax; peduncles not deflexed in age; calyx-appendages evident; corolla white or bluish, basin-shaped or broadly campanulate, not hairy within, devoid of blue or purple dots; scales semicircular, oblong or triangular, entire or lacinate, not reduced to hairy lines.

The most common species, growing in every cañon and by every shady roadside in the San Francisco Bay region. Less common in the Sierra Nevada foothills. Extremely variable and includes a great number of inconstant

ecological forms. Var. *PULCHELLA* Chandler. Distinguished by the minute or even obsolete calyx-appendages, and the rotate-campanulate deep blue corolla; scales linear, ciliate.—Foothills of the southern Sierra Nevada, rare (N. pulchella Eastw.).

3. ELLISIA L.

Annuals, similar to *Nemophila* and scarcely separable. Leaves opposite or the uppermost alternate, pinnately parted or twice or thrice pinnately dissected. Flowers bractless, in axillary peduncled racemes. Calyx without appendages at the sinuses, and usually much enlarged under the fruit. Corolla white, campanulate, shorter or little longer than the calyx, the internal appendages minute or none. Ovules 4 to 8. Seeds not carunculate. (John Ellis, English botanist of the 18th century, whom Linnaeus called a "bright star of natural history.")

Leaves once pinnately parted; ovules 4, borne on the front of the placenta.....

Leaves twice to thrice pinnatifid; ovules 8, 2 on the front and 2 on the back of each placenta 1. *E. membranacea*.
..... 2. *E. chrysanthemifolia*.

1. *E. membranacea* Benth. Stems procumbent, 1 to 2 ft. long; herbage glaucous, the leaves with a few short scattered stiff hairs, the stems with minute prickles on the angles; leaves pinnately divided, with 2 broad lobes (obtuse at apex and broadest at base) spreading at right angles to the terminal lobe, or often with 4 to 8 similar lateral lobes; petiole wing-margined; flowers racemose, few or many on the peduncles; calyx without appendages, its lobes ciliate-bristly; corolla white with a small lance-shaped purple spot in the center of each lobe, 2 lines broad, no scales in the throat but with 10 glandular elevations; capsule with several muricate prickles, 1 or 2-seeded; seed globose, reticulated.

Shady places in the foothills: Santa Clara Co., Mt. Diablo and Tulare southward to Southern California. Mar-Apr.

2. *E. chrysanthemifolia* Benth. Stem erect, freely branching, 1 to 2 ft. high; leaves twice to thrice pinnately dissected; flowers loosely racemose; corolla open-campanulate, surpassing the oval calyx-lobes; the placenta line and exactly conform to the valves; two roughened seeds are borne on the front of each placenta, and smooth ones are concealed behind each placenta, that is, between the placenta and the valve.

Shady ground: San Francisco Bay to Southern California.

4. PHACELIA Juss.

Perennial or annual herbs of marked aspect, with alternate leaves. Flowers blue or white, in scorpioid spikes or racemes. Calyx of 5 nearly distinct sepals, commonly accrescent. Corolla from nearly rotate to campanulate, tubular or funnellform, promptly deciduous, the tube commonly with internal lamellate projections or appendages. Stamens inserted on the base of the corolla. Style 2-cleft. Capsule 1-celled or nearly or quite 2-celled by the approximation or union of the placenta in the axis, 2-valved, the thin septa-like placenta adherent to the valves. Seeds reticulate-pitted or favose. (Greek phakelos, a cluster, many species with crowded flowers.)

A. Ovules 4 or more on each placenta; capsule not less than 6-seeded; stamens shorter than (rarely equaling) the corolla; annuals.

Corolla-tube without internal scales or appendages.

Leaves pinnatifid; corolla open-campanulate, twice the length of the calyx.....
..... 1. *P. douglasii*.

Leaves entire or mostly so.

Corolla narrow, 3 lines long or less, little larger than the calyx... 2. *P. circinatiformis*.

- Corolla rotate-campanulate, 6 to 9 lines broad, much longer than the calyx.....
 Corolla-tube without appendages; leaves coarsely toothed; corolla narrowly funnelform,
 its limb 3 lines broad.....^{3. *P. divaricata*.}
^{4. *P. brachyloba*.}

B. Ovules 2 to each placenta; capsule 1 to 4-seeded; stamens exserted or included;
 corolla-tube with appendages.

1. *Leaves pinnately parted or divided, the divisions pinnately toothed or incised.*
 Fruiting sepals chartaceous, oblong to broadly ovate; stamens not exserted; annual....
^{5. *P. ciliata*.}
 Fruiting sepals herbaceous.
 Leaf-like divisions rather coarse; fruiting sepals linear-spatulate to obovate; stamens
 exserted; perennial^{6. *P. ramosissima*.}
 Leaf-divisions fine; annuals.
 Fruiting sepals linear-spatulate to obovate; appendages with free pointed apex; stamens
 little or not at all exserted.....^{7. *P. distans*.}
 Fruiting sepals linear; appendages entirely adnate; stamens conspicuously exserted..
^{8. *P. tanacetifolia*.}

2. *Leaves with shallow lobes, not parted or divided; annuals.*

- Stamens exserted^{9. *P. malvaefolia*.}
 Stamens included^{10. *P. rattanii*.}
 3. *Leaves entire or pinnately parted or divided into 3 to 7 entire lobes, the terminal
 frequently largest.*
 Stamens conspicuously exserted, bearded at the middle; perennials or biennials.
 Herbage pubescent and hirsute.....^{11. *P. californica*.}
 Herbage hispid-bristly with stinging hairs^{12. *P. nemoralis*.}
 Stamens glabrous, included; annual^{13. *P. breweri*.}

1. *P. douglasii* (Benth.) Torr. Branched from the base with ascending
 or decumbent stems 4 to 8 in. long, or dwarf and but 1½ in. high; herbage
 puberulent and hirsute with mostly spreading hairs; leaves elongated-oblong or
 linear in outline, pinnatifid or pinnately parted into several or many lobes, the
 terminal not larger; flowers loosely racemose; pedicels slender, frequently
 longer than the flowers; sepals spatulate, 1 to 3 lines long, ⅓ to ½ the length
 of the open-campanulate light blue corolla; internal appendages semi-oblancoo-
 late; style 2-cleft above the middle; ovules to each dilated placenta 12 to 24;
 capsule ovate, mucronate; seeds scrobiculate.

Sandy soils near the ocean: San Francisco to Monterey and southward. Also
 at Antioch. In habit suggestive of *Nemophila menziesii*.

2. *P. circinatifomis* Gray. Diffusely branching from the base, 5 in. high,
 puberulent and hispid; leaves elliptic to oblong-lanceolate, parallel-veined,
 entire, strigose-hispid; flowers short-pedicel or at first nearly sessile, in dense
 racemes or spikes; sepals in fruit linear-spatulate, nearly or quite 6 lines long,
 twice or thrice the length of the capsule, hirsute or hispid with long spreading
 hairs, especially toward the base; corolla dull white (?), narrowly funnelform,
 2½ to 3 lines long; capsule ovate, acute or mucronate, 6 to 16-seeded; seeds
 scrobiculate.

Mt. Diablo; Mt. Hamilton; Mariposa Co. A rare plant.

3. *P. divaricata* (Benth.) Gray. Diffusely branched from the base, the
 branches 3 to 10 in. long or more; herbage both pubescent and hirsute; leaves
 from ovate to broadly oblong, 1 to 2 in. long, equaling or exceeding the petioles,
 entire or rarely with a pair of supplementary lobes at summit of the petiole;
 pedicels about a line long; sepals in fruit linear, 4 to 6½ lines long, sparsely
 hispid-ciliate, with somewhat thickened margins and prominent midnerve and
 cross-veins; corolla blue, broadly open-campanulate, 6 to 9 lines broad; style
 2-cleft at apex; seeds 7 to 10, somewhat pitted.

Common on open hillsides in the Coast Ranges of middle California; Mt.
 Diablo; Oakland Hills; San Mateo Co.; Sausalito; Mt. Tamalpais. Mar.-Apr.

4. *P. brachyloba* Gray. Branched at the base, the branches erect or ascending, 12 to 15 in. high; herbage pubescent and glandular, very sweet-scented; leaves elliptic to oblong, coarsely and sometimes doubly toothed, 1 to 2 in. long, on petioles nearly as long; racemes solitary or in pairs, dense; sepals spatulate, entire, in fruit much exceeding the capsules; corolla pale blue, 3 lines broad, the tube yellowish, 4 lines long, devoid of scales or crests; stamens unequal and unequally coherent with tube; capsule 12 to 16-seeded; seed oval, the coat pitted like a honeycomb.—(*P. suaveolens* Greene.)

North Coast Ranges (Vaca Mts., Mt. Hood Range, Mt. Tamalpais); Monterey and Southern California. A rare plant within our limits.

P. WHITLAVIA Gray. Loosely branching, hirsute glandular annual, $\frac{1}{2}$ to 1 ft. high; corolla violet-purple, broadly cylindraceous, 9 or 10 lines long, its lobes $\frac{1}{3}$ to $\frac{1}{2}$ the length of the tube.—Southern California. Appendages of the filaments hairy.

P. BOLANDERI Gray. Stoutish 1 to 2 ft. high; leaves oblong with 1 or 2 pairs of small divisions at base; inflorescence at length geminate-racemose; corolla nearly rotate, very pale blue or white, $\frac{1}{2}$ to 1 in. wide; stamens somewhat exserted, sparingly hairy; style cleft to middle or below.—Rocky soil or on cliffs: Hubbard's Station near main Eel River south to Signal Ridge (Mendocino Co.). Odor disagreeable. Imparts a brown stain to paper in drying.

5. *P. ciliata* Benth. Branched from the base with rather simple ascending branches, 9 to 14 in. high; herbage scabrous, otherwise glabrous; leaves pinnately divided, the divisions oblong, toothed or incised; spikes in terminal clusters or geminate or solitary; sepals in fruit oblong to broadly ovate, chartaceous, 3 to 4 lines long, with thickened margins and prominent midrib and reticulations, sparsely bristly-ciliate; corolla blue; capsule ovate, mucronate; sepals in fruit twice as long, arched over the capsule, their tips meeting; seeds broadly oblong, over 1 line long, the surface with regular or honeycomb-like pits.

Valley fields: Sacramento Valley; South Coast Ranges (Newark, Belmont, Monterey); Southern California. Sometimes locally abundant. Apr.-May.

6. *P. ramosissima* Dougl. Perennial, somewhat diffuse; herbage somewhat glandular; hispid throughout and soft-pubescent (or only the leaves hispid); leaves pinnately divided into 5 to 9 oblong and serrate or incised divisions, the lower distinct, the upper more or less confluent; stamens and style somewhat exserted; corolla yellowish white or bluish; calyx-lobes linear-spatulate to obovate, twice the length of the capsule or longer; seeds oblong, 1 line long.

Coast Ranges and Sierra Nevada, south to Southern California and north to Washington.

P. HISPIDA Gray. Caterpillar Phacelia. Diffusely branched Borage-like annual with long slender white bristles; corolla pale blue, campanulate, the stamens not or scarcely exserted.—Santa Barbara to San Diego.

7. *P. distans* Benth. *VERVENIA*. Erect and strict, or branching and diffuse, 8 to 13 in. high; herbage with scattered hispid hairs and close fine pubescence; leaves pinnately divided, the divisions commonly linear, once or twice pinnately and (for the most part) finely dissected; spikes scattered, solitary or geminate; sepals unequal, narrowly obovate to spatulate, rarely linear; corolla 3 to 4 lines long, rotate-campanulate, sordid white or violet; internal appendages semi-ovate with free tips; stamens little or not at all surpassing the corolla-lobes; capsule globose.

Higher hills of the Coast Ranges: Napa Valley; Bodega; Mt. Tamalpais; Berkeley Hills and southward to Southern California.

8. *P. tanacetifolia* Benth. FIDDLE-NECK. Stoutier than *P. distans*, erect, less frequently branching, the leaves similar but commonly less finely dissected; racemes 3 or 4 in. long, ascending and approximate; sepals linear, beset with rigid bristles, in fruit little exceeding the oval capsule; corolla open-campanulate, 3 to 4 lines long, lavender-color or bluish; internal appendages entirely adnate by the inner margins; stamens much exserted.

Sacramento Valley and southward to Southern California. Apr. It furnishes bee pasturage in about six weeks from seed and the bloom lasts about six weeks. The nectar flows all day. The honey is amber in color, sometimes light green and of a mild aromatic flavor. Cows fed on it show a marked increase in yield of milk but will not eat it alone at first. Cultivated by beesmen in southern Germany (Harry E. Horne).

9. *P. malvaefolia* Cham. STINGING PHACELIA. About 1½ ft. high, hispid-bristly throughout, the bristles with a conspicuous pustulate base; leaves simple, petiolate, round- or elliptic-ovate with broad and frequently truncate or cordate base, slightly 5 to 9-lobed, toothed, 1 to 3 in. long; spikes solitary or geminate; corolla white, longer than the unequal linear-spatulate sepals; stamens exserted; capsule 2-seeded; seeds pitted.

Oakland, San Francisco and Angel Island.

10. *P. rattanii* Gray. Similar but the spikes more slender and elongated; four sepals spatulate, the fifth obovate and longer; corolla only 2 lines long. Northern Sonoma Co. to Ukiah. June.

11. *P. californica* Cham. ROCK PHACELIA. Erect, stout, 1¼ to 2 ft. high, from a branched but depressed leafy woody caudex; stems and petioles with scattered hispid hairs; the foliage strigose, either green or canescent; leaves pinnate or pinnatifid, the large terminal lobe elliptic to lanceolate, with 1 to several pairs of smaller or much reduced leaflets or lobes below, or entire; petioles commonly long; spikes dense, ascending or erect, 1 to 2 in. long, mostly rather short-peduncled, usually in a paniculate cluster at the end of the stem; sepals oblong; corolla purple or white, 3 lines long; stamens exserted, long-hairy at the middle.

Very common throughout our district on rocky points and ledges, in typical form on the San Francisco Peninsula and in Marin Co. May-June. Variable in habit. Var. *IMBRICATA* Jepson. Taller, often 2½ ft. high; racemes 2 to 4 in. long, scattered in a looser panicle, less commonly in 2s and 3s and mostly on longer peduncles; corolla dingy white; fruiting calyces ovate, conspicuously imbricated.—St. Helena; foothills of the Vaca Mts.

12. *P. nemoralis* Greene. Stems 1 or few, simple below, paniculately branched above, 1¼ to 3 ft. high, very bristly with stinging hairs; herbage light green; leaves elliptical to oblong, 1 to 4 in. long, simple and entire or with a pair of small leaflets at base; radical and lower leaves on petioles 2 to 3 in. long, uppermost short-petioled or sessile; fully developed spikes 2 in. long or more, slender, in twos or threes, terminating the stems or lateral branches; corolla whitish, 2 lines long, the flower otherwise as in no. 11, to which it is very closely related; capsule 2-seeded.

Open woods: Santa Cruz Mts.; Berkeley Hills; Sonoma Co.

13. *P. breweri* Gray. Four to 7 in. high, diffusely branching at the base, the stems slender and with rather long internodes; herbage harshly pubescent with rather short hairs; leaves oblong-lanceolate, entire, cleft towards the base,

or the lowermost and radical pinnately divided; racemes slender and lax, 2 or 3 in. long, often geminate at the ends of the branches; sepals linear; corolla 2 to 2½ lines long; filaments glabrous, not exserted; capsule ovate, mostly 1-seeded.

High dry slopes of the South Coast Ranges: Mt. Diablo; Mt. Day, *Dr. R. J. Smith*; Mt. Hamilton; Coyote Creek westerly to Santa Cruz and south to Monterey (*Erythra*, i, 93).

5. EMMENANTHE Benth.

Annuals. Corolla cream-color or yellow, campanulate, persistent; not otherwise differing in technical character from *Phacelia*. (Greek *emmeno*, to abide, and *anthos*, flower, the corolla not deciduous.)

1. *E. penduliflora* Benth. WHISPERING BELLS. Erect, usually much branched from the base, 8 to 14 in. high, villous-pubescent and somewhat viscid; lobes of the pinnatifid leaves numerous, short, toothed or incised; racemes loose, straight, ascending, panicle at summit of the stem; pedicels filiform, as long as the flowers, these soon pendulous; calyx with ample ovate divisions; corolla broadly campanulate, 4 to 5 lines long, the filaments adnate to the very base; style deciduous; placentae conspicuously dilated in the axis; seeds conspicuously pitted in somewhat regular lines.

Higher slopes of the Coast Ranges and Sierra Nevada, in open places or in chaparral, and southward to Southern California. Common. June-July.

6. ROMANZOFFIA Cham.

Low and delicate perennial herbs with the aspect of some species of *Saxifraga*. Stems somewhat scape-like, loosely racemose. Leaves mostly radical (the cauline alternate), round-cordate, crenately lobed, long-petioled. Flowers white. Calyx 5-parted. Corolla broadly funnelform, destitute of appendages, deciduous. Stamens unequal, inserted on the base of the corolla-tube. Style filiform, entire; stigma small. Capsule 2-celled or nearly so, with narrow placentae. Seeds numerous. (Count Romanzoff, promoter of the Russian voyage of Kotzebue; dedicated to him by Chamisso, the German poet, who accompanied the expedition as botanist.)

1. *R. sitchensis* Bong. Filiform rootstock bearing tubers; stems slender, 4 to 9 in. high; pedicels spreading, much longer than the flowers; calyx-lobes linear or lanceolate, not more than ½ as long as the corolla and exceeded by the capsule.

On moist rocks in shady places near the coast: San Mateo Co. and Mt. Tamalpais northward to southeastern Alaska. Rare within our limits.

7. ERIODICTYON Benth.

Low shrubs. Leaves alternate, pinnately veined, finely reticulated, coriaceous, dentate, and petiolate. Inflorescence a terminal, usually naked, panicle of scorpioid cymes. Sepals narrow, not dilated above. Corolla funnelform to campanulate, its tube without appendages. Filaments more or less adnate to the tube of the corolla, little or not at all exserted, sparsely hirsute. Ovary nearly or quite 2-celled by the meeting of the dilated placentae in the axis; styles 2, distinct. Capsule 2 lines long or less, first loculicidal, then septicidal, thus 4-valved, each valve with a short beak or acumination and closed on one side by the adherent dissepiment or half-partition. (Greek *erion*, wool, and *diktumon*, a net, by reason of the netted woolly under surface of the leaves.)

1. *E. californicum* (H. & A.) Greene. YERBA SANTA. MOUNTAIN BALM. Shrub, commonly 3 to 4 ft. high; leaves oblong to oblanceolate, tapering below

and frequently above, dentate except at base or below the middle, very glutinous, the areas between the veins and cross-veinlets on the under surface with a close dense felt; calyx 1 line long with linear lobes; corolla white or pale blue, tubular-funnelform, 4 to 6 lines long; stamens and styles included.—(*Eriodictyon glutinosum* Benth.)

Highest mountain slopes and dry ridges, common or often abundant over extensive areas through the Coast Ranges, and at middle altitudes in the Sierra Nevada, often associated with the Chamise.

BORAGINACEAE. BORAGE FAMILY.

Herbs, usually rough with coarse hairs. Leaves simple, commonly entire and alternate. Flowers complete, in one-sided spikes or racemes, coiled spirally (scorpioid) and uncoiling as flowering proceeds. Calyx with commonly 5 divisions or teeth. Corolla regular, 5-lobed, with 5 stamens inserted on its tube and alternating with its divisions. Ovary superior, deeply 4-lobed (except in *Heliotropium*), with a simple style inserted between the lobes, in fruit splitting into 4 one-seeded nutlets. Style entire (in ours) or none. Nutlets commonly roughened or prickly, inserted on a short thick prolongation of the receptacle, here sometimes referred to as the gynobase. Endosperm none, except in *Heliotropium*.

A. Style none.

Ovary not lobed, in fruit splitting into 4 one-seeded closed cells; anthers connivent; glabrous glaucous succulent perennial.....1. *HELIOTROPIUM*.

B. Style present.

Ovary deeply 4-lobed, when ripe splitting into 4 one-seeded nutlets.

Nutlets erect; ours annuals.

Corolla white.

Calyx persistent; lowest leaves opposite.....2. *ALLOCARYA*.

Calyx and short pedicel at length deciduous; leaves alternate.....3. *CRYPTANTHE*.

Calyx persistent or circumscissile near the base; leaves mostly in a radical rosette, the cauline alternate.....4. *PLAGIOBOTHRYS*.

Corolla yellow.....5. *AMSINCKIA*.

Nutlets flattish, divergent, margined all around or at apex with bristles; corolla minute, white; small annuals.....6. *PECTOCARYA*.

Nutlets broad, depressed, covered all over with short barbed prickles; corolla blue with a ring of appendages or crests at the throat; perennials.....7. *CYNOGLOSSUM*.

1. *HELIOTROPIUM* L. *HELIOTROPE*.

Ours a prostrate fleshy perennial with white flowers in dense one-sided spikes. Corolla salverform, short, with open throat; sinuses more or less plaited in the bud. Anthers connivent, nearly sessile. Style none in ours. Stigma annular and turned downward over the summit of the ovary and thus resembling a skull-cap. Ovary not lobed but separating when ripe into 4 one-seeded closed cells. (Greek *helios*, sun, and *trope*, a turning, "the flowers beginning to appear at the summer solstice.")

1. *H. curassavicum* L. CHINESE PUSLEY. Glabrous, glaucous, the stems branching, $\frac{1}{2}$ to several ft. long; leaves obovate to broadly oblanceolate; spikes mostly in pairs; corolla white with the yellow eye changing to purple.

Common along the seashore, in stream beds, and in low moist or alkaline lands throughout California. June-Nov. Immigrating locally.

2. *ALLOCARYA* Greene.

Low herbs of wet ground, ours annuals, mostly branching from the base. Leaves linear or narrow, entire, the lowest always opposite. Pedicels more or

less 5-angled under the flowers, persistent. Calyx 5-parted to the base, indurated and somewhat accrescent in fruit. Corolla white with yellow throat, salverform, with short tube; processes or crests in the throat none (?) or not obvious. Nutlets ovate or lanceolate-ovate, smooth, rugose, tuberculate or even with barbed or prickly points, often carinate on one or both sides. Scar of the nutlet basal or above the base, concave or sometimes raised and stipe-like. (Greek allos, diverse, and karua, nut, the plants separated from *Cryptanthus* on account of the different fruits.)

Herbage densely pubescent, the hairs long and rather soft.....1. *A. mollis*.
Herbage hispid or rough-pubescent.

Nutlets rugose or tuberculate.

Pedicels about 3 lines long2. *A. chorisiana*.

Pedicels 1 line long to almost none.

Rachis of the spike fistulose-enlarged3. *A. salina*.

Rachis of the spike not fistulose.

Pedicels turbinate-thickened beneath the flower; corolla 2 to 3 lines broad; nutlets rather slender, stipitate.....4. *A. stipitata*.

Pedicels not thickened; corolla 1 to 1½ lines broad; nutlets ovate.

Nutlets carinate ventrally and a little past the apex dorsally...5. *A. californica*.

Nutlets carinate ventrally and dorsally, the dorsal rugae dentate-interrupted...

6. *A. trachycarpa*.

Nutlets with barbed or hispid prickles7. *A. greenei*.

1. *A. mollis* (Gray) Greene var. *vestita* Jepson. A rather rank plant with many ascending branches 12 to 18 in. long or more; herbage very densely and conspicuously hairy throughout even to the very calyces; spikes 3 to 6 in. long, bractless; flowers about 2 lines broad; fruit not scattered; nutlets either light or dark colored, exceeding ½ line, regularly reticulate on the back, carinate from the apex to below the middle (the carina there vanishing in the meshes of the reticulation) or not carinate, strongly ridged ventrally down to the roundish scar, which is bounded toward the base by a horseshoe-shaped ridge.—(*A. vestita* Greene.)

Petaluma, *Congdon*, 1880; not since collected.

2. *A. chorisiana* (Cham.) Greene. Diffuse (or at first erect) with reclining branches 7 to 16 in. long, strigose throughout; radical leaves linear-elongated, often 4 in. long; racemes elongated, at length very loose, leafy below; fruiting pedicels about 3 lines long, seldom or never less than 1 line long; calyx little accrescent, about 1 line long, the segments at length spreading; corolla 3 to 4 lines wide; nutlets ovate, ½ line long or a trifle more, dark brown, carinate ventrally only, or also dorsally toward the apex, rugose and minutely granulate; scar linear.—(*Eritrichium chorisianum* DC.)

Low ground about San Francisco Bay: Vallejo; Belmont. Apr.-June.

3. *A. salina* Jepson. Branched from the base, strictly erect and simple, 5 to 6 in. high; rachis of the spikes fistulose-enlarged, the flowers rather dense, but strictly unilateral in 2 rather marked rows; calyx-segments spatulate or ovate, very strongly callous-thickened toward the base, the sinus next the axis much deeper than the others, some of the outer sepals united nearly to the summit in some cases; nutlets roughish papillate, with rather sharp lateral angles, carinate dorsally.

Alvarado, margin of salt marshes.

4. *A. stipitata* Greene. Branched from the base and somewhat spreading, the branches mostly simple, slender, commonly 9 to 12 in. long; leaves linear-oblancoate, 1 to 3 in. long, or the radical obovate or oblong, attenuate into a long petiole; corolla 2 to 3 lines broad, white with yellow eye or the eye changing to white; sepals at length brownish and often spreading; nutlets

somewhat flattened on the back, rugose and papillate, strongly carinate at apex, the dorsal carina continuous to the base or obsolete below the middle; sear short-stipitate; sepals at length brownish and often spreading.

Very common on the plains of the Sacramento and inner South Coast Ranges. Apr.-May. Very robust specimens frequently show strictly virgate branches nearly or quite 2 ft. long, flower-bearing throughout their entire length. The very short stipe is evident only as a narrow constriction between the elevated sear and the body of the nutlet.

5. *A. californica* (F. & M.) Greene. Similar in habit to *A. stipitata*; flowers 1 to 1½ lines broad; nutlets ovate, carinate ventrally and a little past the apex dorsally, usually grayish; sear not raised; rugae mostly oblique and branched.—(*Eritrichium californicum* DC.)

Coast Range and interior valleys: Russian River; Solano Co. and southward to Hollister. Var. *STRICTA* Jepson. Slender, strictly erect, almost simple, 5 to 7 in. high, somewhat succulent; spikes very dense.—*Calistoga*. Var. *SUBGLOCHIDIATA* Gray. Branches succulent, often prostrate; calyx-lobes accrescent; nutlets with minute muriculations and sharp-edged transverse rugulae commonly tipped with a tuft of penicillate bristles.—Colusa Co. to the San Joaquin Valley.

6. *A. trachycarpa* (Gray) Greene. More or less diffuse or decumbent; racemes leafy throughout or nearly so; calyx-segments spreading; corolla small, 1 to 1½ lines broad; nutlets broadly ovate, transversely rugose and papillate or muricate, carinate ventrally and dorsally; dorsal rugosities commonly simple, and keel mostly dentate-interrupted.

Sonoma Co., southward to Hollister and the San Joaquin plains. Papillae of the nutlet sometimes slender and rough, apparently passing into less bristly forms of *A. Greenei*.

7. *A. Greenei* (Gray) Greene. Diffusely branched from the base, the straggling branches commonly 1 ft. long or more; herbage strigulose-pubescent; leaves linear-oblongate; racemes simple, leafy or bracteate below, the flowers scattered; nutlets 1 line long, ovate, rather densely covered with slender barbed prickles; prickles ¼ to ½ line long, quite distinct at base.

Abundant in fields of the upper Sacramento Valley and southward to the lower San Joaquin.

3. *CRYPTANTHE* Lehm. NIEVITAS.

Annuals with the white flowers nearly always sessile and scorpioid-spicate. Calyx 5-parted to the base, as long as the corolla-tube; segments more or less hispid or with hooked bristles, in fruit usually closely embracing the nutlets, eventually deciduous. Nutlets 4, sometimes 3, 2 or 1, smooth, papillate, or muriculate, never rugose; face of nutlet with a ventral groove from the apex to the sear near the base, usually continued beyond the sear as a fork and either open (areolate) or closed. Nutlet attached to the subulate gynobase from the sear halfway or wholly to the apex along the groove. (Greek *kruptos*, hidden, and *anthos*, flower, perhaps on account of the minute flowers in some species.)

Nutlets papillate or muricate, 4 (or 3).

Fruiting calyx at least twice as long as the nutlets, these with obtuse lateral angles....

1. *C. ambigua*.

Fruiting calyx surpassing a little and somewhat connivent over the acutely angled nutlets.

Plants erect, commonly branching; nutlets about 1 line long.....2. *C. muriculata*.

Plants erect, branching but very strict; nutlets smaller.....3. *C. Jonesii*.

Plants diffuse, very slender; nutlets ¼ line long4. *C. micromeres*.

Nutlets smooth.

Nutlet 1, much surpassing the short gynobase.

Corolla very small ($\frac{1}{2}$ line broad or less); branches commonly diffuse.....

5. *C. microstachys*

Corolla larger (nearly or quite 1 line broad); stem rigidly erect.....6. *C. flaccida*.

Nutlets 4 (or 3); gynobase subulate, $\frac{1}{2}$ to as long as the nutlets.

Groove simple, sometimes not closed at base, but not forked7. *C. leiocarpa*.

Groove forked at base, but no open areola8. *C. torreyana*.

1. *C. ambigua* (Gray) Greene. Much branched from the base, $\frac{1}{2}$ to $1\frac{3}{4}$ ft. high, rough-hirsute throughout; leaves linear, 1 to $1\frac{1}{2}$ in. long; spikes 1 to $2\frac{3}{4}$ in. long; commonly very loose below, ternate or geminate, often pedunculate; calyx exceeding 1 line in length; sepals linear, more densely hispid-bristly towards the base; corolla $2\frac{1}{2}$ to 3 lines broad; nutlets gray, 4 or 3, narrowly ovate, papillate but not pointed or prickly, the lateral angle obtuse and the groove more or less closed, with the basal bifurcation open-areolate (or sometimes closed?).

Hills and mountains: St. Helena and northward throughout northern California.

2. *C. muriculata* (A. DC.) Greene. Robust, branching, rough-hirsute or hispid, $\frac{1}{2}$ to $1\frac{1}{4}$ ft. high, with well-developed rather dense spikes mostly in 2s and 3s at the end of the branches; calyx $1\frac{1}{2}$ lines long; corolla 2 or 3 lines broad; nutlets 1 line long, muricate-papillose, and somewhat rugose on the back; ventral groove and its basal bifurcation mostly closed; lateral angles aesthus, distinct.—(*Eritrichium muriculatum* A. DC.)

Mt. Diablo Range from near Antioch southward. Apr.

3. *C. jonesii* (Gray) Greene. Erect, strict, 7 to 14 in. high, leafy below; lateral spikes from near the base or above the middle short, often sessile, the terminal spikes longer in a rather close panicle; corolla less than 1 line broad in dried specimens; sepals linear, obscurely unicostate, bristly-hispid, in fruit about 1 line long, slightly surpassing the rough-papillate ovate nutlets which are acutely angled laterally and little more than $\frac{1}{2}$ line long; ventral groove mostly closed and forked below.

Sonoma; Mt. Tamalpais; Santa Cruz; Soledad. Nutlets sometimes smooth and concave on either side of the ventral groove.

4. *C. micromeres* (Gray) Greene. Slender, rather widely branched above the base, 7 to 9 in. high, rough-hirsute almost throughout; spikes mostly terminal or subterminal, not dense, 2 to 4 in. long; nutlets similar to the preceding, little more than $\frac{1}{4}$ line long, slender papillate (or on either side of the ventral groove concave and either papillate or smooth).

Santa Cruz; Los Gatos (Muhl., iii, 118); Sierra Nevada foothills at Mokelumne Hill, *Rattan*, the spikes after the fall of the flowers obscurely flexuous.

5. *C. microstachys* Greene. At first erect and 3 or 4 in. high, later diffuse with ascending or reclining branches $\frac{3}{4}$ to 2 ft. long, bristly throughout; spikes slender, 4 to 6 in. long, rather densely flowered; sepals less than 1 line long, very hispid-bristly; nutlet 1, brown, smooth, ovate, with long and slightly contracted apex, slightly compressed but not angled laterally, $\frac{2}{3}$ to 1 line long; groove closed, with a minute fork at base.

Santa Cruz Mts.; Vaca Mts. May-June.

6. *C. flaccida* (Dougl.) Greene. Strictly and rigidly erect, with few ascending branches at the top, $\frac{3}{4}$ to $1\frac{1}{4}$ ft. high; leaves linear; spikes 2 to 4 in. long, at length not crowded; corolla nearly or quite 1 line broad; fruiting calyx $1\frac{1}{2}$ lines long, appressed to the rachis, its narrowly linear segments thickish at base, connivent above, nearly twice as long as the nutlet, hispid and

bearing toward the base a deflexed tuft of bristles; nutlet 1, rostellate-acuminate at apex, the groove enlarged below but not forked.

Common on low dry gravelly hills of the inner Coast Ranges; Sierra Nevada.

7. *C. leiocarpa* (F. & M.) Greene. Commonly branched from the base, with many erect or ascending branches, 5 to 13 in. long; branches mostly simple below, branching above, and bearing many spikes which are often more or less congested; spikes leafy-bracted, rarely bractless, the terminal longer and interrupted, the lateral short and glomerate; sepals short-linear, hispid-bristly; nutlets usually 4, rarely 1, narrowly ovate, acute, $\frac{2}{3}$ line long, the ventral groove not forked, or scarcely so.—(*Eritrichium leiocarpum* Wats.)

Sandy lands near the coast: San Francisco northward and southward. June. Stems sometimes short and caespitose, nearly always from a rather strong taproot. Bristles often pustulate-dilated at base. Nutlets mottled transversely on the ventral side and longitudinally on the back.

8. *C. torreyana* (Gray) Greene. Erect, branched from the middle and sometimes from the base; spikes commonly elongated, loose below, frequently geminate; nutlets ovate, acute, the groove forked at base, the fork sometimes minute.

Napa Valley, *Torrey*; common in the Sierra Nevada, at least northward.

4. *PLAGIOBOTHRYS* F. & M. POP-CORN FLOWER.

Rather slender annuals with mostly soft pubescence, the hairs often rusty when young, especially on the calyx. Leaves mostly in a radical tuft. Racemes spike-like, elongated, loose and sometimes leafy. Pedicels very short or almost none, filiform, persistent. Corolla short, white, with crests or processes at the mouth of the throat (or the crests absent?). Nutlets ovate, carinate on both sides towards the apex and often also laterally margined, on the back rugose or roughened; insertion above the base or median, the scar raised and rounded and leaving a corresponding depression on the receptacle or gynobase. (Greek *plagios*, on the side, and *bothrus*, pit or excavation, the first known species having a hollow scar.)

Scar of nutlet raised and rounded with a distinct hole or excavation in the middle of it; erect plants 1. *P. rufescens*.

Scar of nutlet solid.

Nutlets glassy, either papillate-scabrous or almost smooth; very slender erect plants.... 2. *P. tenellus*.

Nutlets grayish or brownish, rugose or granulate.

Calyx in fruit circumscissile below the middle, the upper portion falling away; erect plants 3. *P. nothofulvus*.

Calyx persistent, not circumscissile; plants with diffuse, straggling or prostrate branches 4. *P. canescens*.

1. *P. rufescens* F. & M. var. *campestris* Jepson. Branching, 1 to 2 ft. high, hispid-hirsute; leaves linear or lanceolate; racemes very loose, leafless and spike-like but the flowers distinctly pediceled; fruiting calyx 2 to 3 lines long, the segments nearly distinct, lanceolate, persistent, more or less reddish even in age; nutlets $1\frac{1}{2}$ lines long, nearly 1 line wide in the middle, abruptly beaked, the transverse rugae more or less interrupted and often dot-like or granulate; scar raised and ring-like, bordering a deep circular excavation.—(*P. campestris* Greene.)

Low foothills of the Coast Ranges in Solano Co., and northward. Apr.-May.

2. *P. tenellus* Gray. Branching from or near the base, the branches erect or ascending, 3 to 7 in. high; herbage puberulent or the leaves hispidulous; leaves of the radical tuft oblong, acute or obtuse, $\frac{1}{2}$ to 1 in. long; cauline

leaves few, ovate or ovate-oblong, 2 to 3 or 4 lines long; spikes 1 to 3 in. long, comparatively few-flowered; calyx deeply cleft, at first rusty yellowish, at length pale, sometimes imperfectly circumscissile; nutlets minute ($\frac{1}{4}$ line long), shining and enamel-like on the back, smooth but papillate-scabrous on the lateral angles and often also on the rugae; rugae transverse, straight, smooth and low, separated by very fine lines.—(*Eritrichium tenellum* Gray.)

Santa Cruz Mts. (Muhl., iii, 118); North Coast Ranges; Sierra Nevada. Uncommon in our region.

3. *P. nothofulvus* Gray. Plants erect or suberect, 1 to $2\frac{1}{2}$ ft. high; stems 1 to several from the depressed rosulate tuft of leaves, branching mostly above, the branches widely spreading or erect; herbage silky-villous, the hairs very reddish when young, especially on the calyx and sometimes on the leaves; leaves oblong-ovate or lanceolate, those of the radical tuft oblong-ovate or oblanceolate; spikes leafless; calyx cleft to the middle, $1\frac{1}{2}$ lines long, in fruit circumscissile below the middle, the upper part falling away and leaving the persistent base about the nutlets; corolla 2 to 3 lines broad.

Hills and mountain sides of the North Coast Ranges (St. Helena, Vaca Mts.); Sierra Nevada foothills. Mar.-May.

4. *P. canescens* Benth. Branches long and straggling, nearly or quite simple, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long, loosely flower-bearing and leafy nearly throughout, or quite leafless above and spicate; pubescence pale, soft-villous; leaves oblong to linear or lanceolate; calyx cleft to below the middle, the segments broadly lanceolate, in fruit 2 to 3 lines long; nutlets 1 line long, incurved-connivent, rugose-reticulate, the areola longer transversely, and the lateral angles very distinct.—(*Eritrichium canescens* Gray.)

Low open hills of the Coast Ranges and Sierra Nevada. Apr. Calyx in fruit circular-depressed (the tips of the segments connivent over the nutlets), in age deciduous, the very short stubby pedicel persistent. Plants sometimes erect.

5. AMSINCKIA Lehm.

Annuals with rough-hairy herbage, the hairs commonly with pustulate-dilated base, which is often conspicuously hardened or granular. Flowers yellow, in elongated spikes. Sepals 5, or 4 or 3 through the more or less complete union of two into one. Corolla salverform, the throat somewhat funnelform and with more or less distinct folds, but destitute of crests or processes. Nutlets crustaceous, triquetrous or ovate-triangular, smooth or rough. Cotyledons deeply 2-parted. (Wm. Amsinck of Hamburg, patron of the Botanic Garden in that city.)

Nutlets much flattened on the back, with coarse granulations1. *A. tessellata*.
Nutlets beset with prickly projections.....2. *A. echinata*.
Nutlets not prickly.

Nutlets carinate on the back, granulate and rugose.

Corolla 6 lines long or more; nutlets somewhat compressed laterally...3. *A. spectabilis*.

Corolla 5 lines long or less; nutlets much incurved, $1\frac{1}{4}$ lines long....4. *A. intermedia*.

Corolla 6 lines long or less; nutlets $\frac{1}{2}$ line long, scarcely more....5. *A. lycopsoides*.

Nutlets smooth and polished.....6. *A. grandiflora*.

1. *A. tessellata* Gray. Coarsely hispid, 1 to 2 ft. high; leaves linear to oblong-lanceolate; developed spikes 5 to 6 in. long, loose; calyx of 3 or 4 sepals, 1 narrow and 2 broad, or 3 narrow and 1 broad, rusty-hispid, accrescent in fruit with the broadly-ovate foliaceous segments about twice the length of the nutlets; corolla small, orange-yellow; nutlets broadly ovate, abruptly acute, not carinate but flattish on the back, which is surrounded by a dentate border and

filled in with a few short transverse rugae and many wart-like projections fitted closely together, and so resembling a somewhat uneven cobble-stone pavement.— (*A. collina* Greene.)

Near Mt. Diablo, *Brewer*; San Joaquin plains.

2. *A. echinata* Gray. Erect, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, very hispid with white spreading bristles; sepals very narrow, yellow-hispid; corolla light yellow, about twice as long, little dilated at the throat, the limb 2 or 3 lines broad; nutlets muricate with slender points or almost prickly, not rugose.

Plant of the Mohave Region, credited to Antioch.

3. *A. spectabilis* F. & M. Erect, branching above, 1 to $2\frac{1}{2}$ ft. high, with mostly linear or linear-lanceolate leaves; spikes 3 to 7 in. long; calyx-lobes narrowly linear-lanceolate, reddish-hispid, $\frac{1}{2}$ to $\frac{3}{8}$ the length of the corolla-tube; corolla orange-yellow, 6 to 7 lines long with slightly unequal lobes; nutlets somewhat flattened laterally, carinate dorsally and ventrally, reticulate-rugulose and granulate.

San Joaquin Valley; Southern California.

4. *A. intermedia* F. & M. BUCKTHORN WEED. Erect, frequently widely branched, $1\frac{1}{2}$ to 3 ft. high; stems and branches with scattered white bristles, the foliage densely hispid-bristly with rather shorter bristles; inflorescence hispid and with a short curly pubescence; leaves oblong-lanceolate to linear, thickish, entire; racemes more or less crowded at the top of the stem or branches and leafy-bracteate; developed racemes 5 to 10 in. long, peduncled; calyx-segments rusty-hispid, linear-acuminate, $\frac{1}{2}$ as long as the narrow orange-yellow corollas, in fruit twice as long at least as the nutlets; nutlets incurved, carinate dorsally, scabrous-rugose and granulate, exceeding 1 line in length.

Throughout our district, mostly towards the interior; frequently very abundant in grain fields of the Sacramento Valley, forming rank thickets 3 to 4 ft. high.

5. *A. lycopsoides* Lehm. Stems erect, branching, the branches at length decumbent, 1 to 2 ft. long; herbage of a light yellowish green, setose-hispid; leaves ovate-lanceolate or narrowly oblong, with erose-sinuate or entire margins; racemes rather short, frequently leafy-bracteate; peduncles short or none; calyx sparsely setose-hispid, the lobes lanceolate or ovate-oblong, obtuse, 2 or 3 of the lobes often united; corolla pale yellow, very slender; nutlets brown or blackish, muriculate and rugulose, scarcely more than $\frac{1}{2}$ line long.

Sandy soil along the seaboard: San Francisco. Apr.-May.

6. *A. grandiflora* Kleeb. Robust, hispid, $1\frac{1}{2}$ ft. high; fully developed spikes 5 to 7 in. long; calyx-segments fulvous-hirsute, often partly or wholly confluent so as to appear as 3 or 4, in fruit 5 to 6 lines long; corolla 6 to 7 lines long, deep yellow, with ample limb; anthers nearly sessile, inserted very low in the corolla; nutlets perfectly smooth, polished, light gray, carinate ventrally from the apex to the nearly median oblong scar; lateral angles sharp, back concave.

Antioch, *Kellogg*. The nearly related *A. vernicosa* H. & A. may be expected within our limits southward; it has smaller flowers and sharply triquetrous nutlets (resembling a grain of buckwheat) with very obscure scar.

6. PECTOCARYA DC.

Low slender obscure annuals with strigose pubescence and narrowly linear leaves. Flowers minute, white, on very short pedicels, scattered along the stems or branches. Calyx deeply 5-cleft, spreading or reflexed in fruit. Corolla with a circle of processes or crests which almost close the throat. Stamens included. Nutlets flat, thin, radiately divergent, bordered at apex or all around

with a row of bristles hooked at tip. (Greek pectos, combed, and karua, nut, on account of the row of bristles on the nutlet.)

Nutlets not winged, the acute margin bordered all around by bristles.....1. *P. pusilla*.
Nutlets bordered by a wing which bears hooked bristles only at the apex...2. *P. penicillata*.

1. **P. pusilla** Gray. Erect, somewhat flexuous, simple or sparingly branched, 3 to 5 in. high, strigulose-canescens; nutlets 4 and equably divergent (or sometimes but 2), 1 line long, cuneate-obovate or somewhat rhomboidal, carinately nerved on the upper face, not winged, the margin bearing a row of slender bristles hooked at the tip.

Shady north slopes in the hills near St. Helena; Yreka. Mar.-Apr.

2. **P. penicillata** (H. & A.) A. DC. Branching at the base, the branches diffuse, 1 to 4 in. long; nutlets divergent in pairs, oblong, 1 line long, surrounded by a wing which is incurved along the middle in age and bears at the rounded apex a series of slender bristles hooked at the tip.

Napa Valley; and north to British Columbia.

7. CYNOGLOSSUM L.

Ours a coarse perennial herb with broad petioled leaves. Flowers blue, in a panicled bractless raceme raised on a naked terminal peduncle. Corolla with a ring of conspicuous appendages or crests at the throat. Nutlets large, depressed, covered all over with short barbed prickles and thus bur-like. (Greek kuno, dog, and glossa, tongue, on account of the shape and texture of the leaves in some species.)

1. **C. grande** Dougl. WESTERN HOUND'S TONGUE. Erect, 1 to 3 ft. high; leaves mostly radical or subradical, hoary-pubescent beneath, ovate, varying to ovate-oblong or elliptic, rounded at base or truncate, acute or acuminate, 3 to 7 in. long, on petioles often as long; sepals narrowly oblong, obtuse, 2 to 4 lines long; corolla 6 to 7 lines long, the tube often purple, the lobes elliptic; stamens inserted at the throat, on very short filaments.

Coast Range woods: Monterey; Oakland Hills; Marin Co.; Vaca Mts. and northward. Feb.-Mar. Called "Cow Poison" at Smith River in Del Norte Co.

VERBENACEAE. VERBENA FAMILY.

Ours herbs with opposite or whorled leaves. Flowers complete. Corolla bilabiate or almost regular. Calyx persistent. Stamens 4, in 2 pairs. Ovary superior, undivided, 2 to 4-celled, separating at maturity into as many 1-seeded nutlets; style single, entire; stigmas 2 or 1. Endosperm in our genera scanty or none.

Calyx 5-toothed; nutlets 4; diffuse or erect herbs1. VERBENA.
Calyx 2-cleft; nutlets 2; creeping herbs2. LIPPIA.

1. VERBENA L. VERVAIN.

Perennial herbs with simple leaves. Flowers in terminal dense bractless spikes. Calyx narrow, tubular, plicately 5-angled, 5-toothed, mostly enclosing the dry fruit. Corolla salverform with unequally 5-lobed limb. Anthers ovate. Stigmas mostly 2-lobed, the anterior lobe larger, the posterior smooth and sterile. Fruit separating into 4 one-celled one-seeded achene-like nutlets. (Latin name of a certain sacred plant.)

Bracts inconspicuous, not exceeding the flowers.

Stem erect, strict and tall; spikes dense, more or less peduncled; petioles naked.....

1. *V. hastata*.

Diffusely branching; spikes not dense below, sessile or leafy bracted at base; petioles cuneately margined2. *V. prostrata*.

Bracts conspicuous, exceeding the flowers; spikes dense, sessile3. *V. bracteosa*.

1. **V. hastata** L. BLUE Vervain. Erect, strict, 2 to 4 ft. high; pubescence short-hispid; leaves oblong-lanceolate, gradually acuminate, rather finely serrate, 4 in. long or less, on petioles $\frac{1}{2}$ in. long; some of the lower leaves commonly hastately lobed at base; spikes numerous, naked at base or more or less peduncled, densely flowered, 2 to 3 in. long, in a close panicle; corolla deep blue.

Islands of the lower Sacramento River.

2. **V. prostrata** R. Br. COMMON Vervain. Stems diffusely branched or spreading; herbage mostly soft-pubescent; leaves oblong-ovate, coarsely serrate, and often laciniately lobed, especially toward the base which is contracted into the cuneately-winged petiole; spikes 2 or 3 in. to 1 ft. long, solitary, or more commonly loosely paniculate; bracts subulate, shorter than the calyx; corolla violet or blue, 2 lines long.

Dry open hill country throughout western California: Humboldt Co. to southern California. July-Sept.

3. **V. bracteosa** Michx. Diffusely much branched, $\frac{1}{2}$ to 1 ft. high or more; leaves pinnately incised or 3-cleft with coarsely serrate lobes, narrowed at base into a winged petiole; spikes commonly dense, sessile; bracts lanceolate, rigid, conspicuously exceeding the flowers, mostly entire or the lowest incised; corolla small, blue.

Lower San Joaquin; probably introduced.

2. LIPPIA L. LEMON VERBENA.

Ours prostrate perennial herbs with simple leaves. Flowers small, similar to those of Verbena, disposed in short spikes or heads subtended by broad closely imbricated bracts. Pubescence fine, the hairs fixed by the middle and both ends acute. Peduncles slender, axillary. Calyx small and short, in ours 2-cleft, the lobes entire and lateral. Corolla-limb manifestly bilabiate, 4-lobed, the upper lip refuse or emarginate. Style mostly short; stigma thickish, oblique. Pericarp more or less corky, not readily separating into the 2 nutlets. (Dr. A. Lippi, a French naturalist, killed in Abyssinia, in 1703.)

Leaves thickish, oblanceolate or obovate1. *L. nodiflora*.
Leaves thinnish, ovate2. *L. lanceolata*.

1. **L. nodiflora** Michx. MAT-GRASS. Stems extensively creeping from a lignescent perennial base; herbage minutely canescent throughout; leaves thickish, cuneate-oblanceolate or -obovate, sessile, $\frac{3}{4}$ to nearly 1 in. long, sharply serrate towards the apex; peduncles filiform, 1 to 4 in. long, much exceeding the leaves; heads cylindraceous in age, 3 lines thick; calyx with 2 low triangular teeth, these laterally disposed and entire or notched; corolla white, $1\frac{1}{2}$ lines broad, the lower lobe transversely oblong; fruit globose or didymous.

Lower Sacramento and San Joaquin, especially on river banks. Esteemed as a plant covering on levees for the purpose of resisting erosion. July-Sept.

2. **L. lanceolata** Michx. Similar to the preceding, but greener; leaves thinner, 1 to $2\frac{1}{2}$ in. long, ovate, pinnately straight-veined, sharply serrate except at the broadly cuneate base which is abruptly narrowed to a short petiole; peduncles often shorter than the leaves; corolla bluish white.

Common on muddy banks of the islands lying near the confluence of the Sacramento and San Joaquin rivers.

LABIATAE. MINT FAMILY.

Aromatic herbs or low shrubs with square stems and always opposite simple leaves. Flowers perfect, solitary in the axils or more commonly in small

cymes; cymes sessile in the axils of the opposite leaves (rarely peduncled), commonly dense and having the appearance of a whorl, and thus denominated in the descriptions. Subtending leaves of the whorls frequently bract-like and the internodes short, the inflorescence thus becoming spike-like, or the whorl sometimes terminal and head-like. Calyx always synsepalous, frequently bilabiate, usually 5-toothed. Corolla with a distinct tube, bilabiate, commonly with 2 lobes in the upper lip and 3 lobes in the lower lip. Stamens inserted on tube of corolla, 4, in 2 pairs, or the upper pair of stamens wanting or represented by sterile filaments. Ovary superior, 4-lobed (or 4-parted in *Trichostema*), separating when ripe into 4 small 1-seeded smooth nutlets. Style single, situated in the depression among the lobes of the ovary, cleft at apex. Nutlets attached by the base (or by the side in *Trichostema*.)

A. Ovary 4-lobed; nutlets attached at the side.

Calyx almost equally 5-cleft; corolla with elongated slender tube and 5 similar oblong lobes, the 4 stamens protruded from the deep cleft of the upper lip, elongated and curved1. *TRICHOSTEMA*.

B. Ovary 4-parted; nutlets attached at the base.

1. *Calyx gibbous on the back.*

Calyx with a gibbous or helmet-shaped protuberance on the back, the 2 lips entire; corolla strongly bilabiate; flowers solitary in the axils of the opposite leaves...2. *SCUTELLARIA*.

2. *Calyx not gibbous on back.*

a. Corolla bilabiate.

Calyx with 10 spinescent teeth hooked at tip; stamens included in tube....3. *MARRUBIUM*.
Calyx-teeth not hooked at tip; stamens not included in the tube (not necessarily exerted from corolla).

Upper pair of stamens longer than the lower.

Stamens not exerted; calyx irregular4. *NEPETA*.

Stamens exerted; calyx-teeth subequal.....5. *LOPHANTHUS*.

Upper pair of stamens shorter than or equaling the lower, or wanting.

Upper calyx-lip truncate, its margin with 3 cusps; flowers in a dense spike.....6. *BRUNELLA*.

Upper calyx-lip not truncate.

Corolla-tube with a hairy ring within; calyx-teeth 5, equal, spine-tipped...7. *STACHYS*.

Corolla-tube having no hairy ring.

Calyx throat very oblique or with unequal teeth.

Stamens with a filiform connective attached by the middle to the filament, or at one end and the point of attachment indicated by an articulation or notch; anther-bearing stamens 2; perennials8. *SALVIA*.

Stamens without filiform connective or articulation.

Annuals.

Anther-bearing stamens 2 (or 4); bracts with very long awn-like spines...

9. *ACANTHOMINTHA*.

Anther-bearing stamens 4 (or 2); bracts merely ciliate.....10. *POGONYNE*.

Perennials; stamens (with anthers) 4; flowers in loose axillary clusters....

11. *MELISSA*.

Calyx-teeth equal or nearly so.

Flowers solitary; calyx-teeth short hairy or glabrous.

Trailing herb12. *MICROMERIA*.

Low shrub13. *SPHACELE*.

Flowers in dense whorls; calyx-teeth very woolly14. *KOELLIA*.

b. Corolla nearly regular.

Flowers in terminal heads15. *MONARDELLA*.

Flowers in axillary whorls.

Stamens 216. *LYCOPUS*.

Stamens 417. *MENTHA*.

1. *TRICHOSTEMA* L. BLUE CURLS.

Ours ill-scented herbs with entire leaves and blue (occasionally pinkish or whitish) flowers in axillary cymes or becoming raceme-like in age. Calyx equally or almost equally 5-cleft. Corolla with oblique limb, the oblong lobes nearly alike; tube in ours slender, far exceeding the calyx and abruptly

geniculate or curved into an arc of a circle just below the limb. Stamens 4, with the anther-cells divaricate; filaments capillary, blue or violet, spirally coiled in the bud, in anthesis very much exerted, ascending between the deeply parted upper lobes of the corolla and curved outward and downward. Nutlets rugose-reticulate. (Greek trichos, hair, and stemon, stamen.)

Stems densely leafy; leaves sessile.....1. *T. lanceolatum*.
Stems sparsely leafy; leaves petioled.....2. *T. laxum*.

1. **T. lanceolatum** Benth. VINEGAR WEED. CAMPHOR WEED. Annual, simple or branching from near the base, 6 to 11 in. high, very leafy; herbage cinereous or villous-pubescent and minutely glandular; leaves lanceolate, acuminate, sessile, or the lowest subsessile, with 3 to 5 strong almost parallel nerves or ribs, 1 in. long; cymes short-peduncled or nearly sessile; calyx villous; corolla almost filiform, somewhat pubescent.

Dry plains and low hills throughout the Coast Ranges, Sierra Nevada foothills and Southern California. A bee-plant of importance, abounding over extensive areas. Aug.-Sept.

2. **T. laxum** Gray. TURPENTINE WEED. Annual, simple or branching, 1 ft. high or less, minutely pubescent, sparsely leafy; leaves lanceolate or oblong-lanceolate, acuminate but obtusish, pinnately veined, 1 to 1½ in. long, on slender petioles; cymes peduncled, rather loose; corolla almost glabrous.

Stream beds or low summer fields of the North Coast Ranges: Sonoma Co.; Napa Co.; Putah Creek and northward. Aug.-Sept.

T. LANATUM Benth. Romero. Leafy shrub 2 to 3 ft. high, remarkable for its virgate purple-woolly spikes and long capillary stamens and style.—Monterey Co. to San Diego. *T. OBLONGUM* Benth. Small annual, the corolla hardly surpassing the calyx if at all.—Sierra Nevada, at the higher altitudes.

2. SCUTELLARIA L. SKULL-CAP.

Ours perennial herbs, the flowers always solitary and either in axillary pairs or, when the leaves are reduced, forming terminal spikes or racemes. Calyx bilabiate, both lips entire, the upper with a scale-like or crest-like projection on the back, in anthesis campanulate, after anthesis closed, and in fruit splitting to the base. Corolla with a long-exserted tube naked within; upper lip galeate, entire or barely notched, the lateral lobes of the lower lip more or less attached to it so that it appears 3-lobed, the middle lobe seeming to constitute the whole lower lip. Stamens 4; anthers ciliate-pilose. Upper fork of style short or none. Nutlets rarely wing-margined. Embryo curved; caulicle short, incumbent. (Latin scutella, a dish, on account of the conspicuous protuberance on the fruiting calyx.)

Rootstocks filiform, bearing tubers; flowers violet-purple.....1. *S. tuberosa*.
Rootstocks not tuber-bearing; flowers whitish.....2. *S. californica*.

1. **S. tuberosa** Benth. BLUE SKULL-CAP. Stems 3 to 5 in. high, from tuberous rootstocks, the tubers oblong, 3 to 8 lines long; herbage pubescent; leaves thin, few-toothed; radical and lower leaves oval, purplish beneath (as also the lower cauline), on petioles as long as the blade; upper cauline ovate, the petioles commonly short; corolla violet-purple, 7 to 9 lines long; middle lobe of lower lip somewhat spreading, much larger than the galeate upper lip; nutlets muricate.

Loamy soil of shady woods or brush in the hills or in sandy valleys: Coast Ranges south to Southern California. Apr.-May. Not reported from the inner North Coast Ranges, nor from the inner South Coast Ranges south of

Mt. Diablo. The var. *SIMILIS* Jepson has a very densely-villous calyx.—Napa Range.

2. *S. californica* Gray. CALIFORNIA SKULL-CAP. Stems clustered, commonly simple, $\frac{3}{4}$ to $1\frac{1}{4}$ ft. high, from horizontal branching rootstocks; herbage puberulent; leaves $\frac{3}{4}$ to 1 in. long, oval-ovate or oblong-lanceolate, the lower disposed to be crenate and purplish beneath, the upper narrower and entire, those subtending the flowers much reduced; petioles 1 to 3 lines long; corolla nearly white or slightly yellowish, 8 to 12 lines long, the throat amplexate-inflated and the lips not very unequal; lower lip villous-bearded within; nutlets rugulose.

Open woods and borders of thickets, on hillsides and in ravines: Coast Ranges; Sierra Nevada.

S. LATERIFLORA L.; well characterized by its small flowers in 1-sided racemes.—Bouldin Island (Zoe, iv, 215). *S. GALERICULATA* L.; leaves thin, ovate-lanceolate, 1 to 2 in. long; flowers blue, 7 to 9 lines long, solitary in the leaf axils; lower lip of corolla not villous.—Bouldin Island; northern Sierra Nevada and northward.

S. BOLANDERI Gray and *S. ANGUSTIFOLIA* Pursh are of the Sierra Nevada; the former has oval leaves, little reduced above, sessile by a cordate base and very veiny, and whitish flowers; the latter has linear or lanceolate entire leaves (or the lowermost broader and serrate) and violet-purple flowers, the lower corolla-lobe villous inside.

3. MARRUBIUM L. HOREHOUND.

Perennial tomentose herbs with much wrinkled leaves and rather small flowers in whorls. Calyx with cylindraceous tube, 10 ribs and as many equal subulate or spinulose teeth, which are recurved at tip. Corolla white, with short tube included in the calyx, the upper lip erect, 2-cleft, the lower spreading, 3-cleft. Stamens 4, included within the tube of the corolla, all the anthers 2-celled. Nutlets rounded at the top. (From the Hebrew, meaning bitter.)

1. *M. vulgare* L. COMMON HOREHOUND. Stems tufted, erect, white-woolly, $\frac{3}{4}$ to $2\frac{1}{4}$ ft. high; leaves roundish, crenate, except at the cuneate or truncate base, petioled, white-woolly beneath and green above, or somewhat tomentose on both faces; middle lobe of lower lip of corolla transversely oblong, much larger than the lateral lobes.

Common naturalized weed of old fields and waste places about farms and villages everywhere in the Coast Ranges, Sacramento and San Joaquin valleys, Sierra Nevada foothills and Southern California. Evergreen with us. The tops used medicinally as a remedy for colds. July-Sept.

4. NEPETA L.

Perennial herbs. Calyx tubular, obliquely 5-toothed, the upper teeth longer than the lower. Corolla-tube enlarged above, distinctly bilabiate; upper lip erect, lower spreading, the middle lobe larger than the lateral. Stamens 4, not exerted, ascending under the upper lip, the lower pair the shorter, all anther-bearing, with the anthers approximate in pairs. Nutlets ovoid, flattened, smooth. (Old Latin name used by Pliny, perhaps from the city Nepete in Tuscany.)

1. *N. cataria* L. CATNIP. Stems 2 or 3 ft. high; herbage canescent with fine hairs, except the green upper surface of the leaves; leaves triangular-ovate, truncate or cordate at base, coarsely crenate, 2 or 3 in. long or the upper reduced, greener above than below, petioled; spikes 1 to 3 in. long, dense or with

1 or 2 accessory whorls below; calyx-teeth lanceolate-subulate; corolla white, 4 or 5 lines long, dotted with purple.

Mountains and higher valleys: Russian River Valley; Lake Co. and northward. July.

N. *hederacea* (L.) Trev. Ground Ivy. Gill-over-the-Ground. Creeping and trailing; leaves reniform; corolla 3 times length of calyx, light blue.—Bouldin Island (N. *glechoma* Benth.; Zoe, iv, 215).

5. *LOPHANTHUS* Benth.

Tall perennial herbs. Leaves ovate, serrate, petioled. Flowers violet-purple or whitish, crowded in a terminal spike. Calyx tubular-campanulate, rather oblique, almost equally 5-toothed. Upper lip of corolla 2-lobed, nearly erect; lower lip spreading, its middle lobe crenate. Stamens 4, exserted, the anthers not approximate in pairs. (Greek *lophos*, crest, and *anthos*, flower.)

1. *L. urticifolius* Benth. Glabrous or nearly so, 3 or 4 ft. high; calyx-lobes membranaceous, pinkish or whitish; corolla light violet-purple, its lobes slightly hairy but throat glabrous.

North Coast Ranges south to Sonoma Co., rare within our limits but common northward and in the Sierra Nevada.

6. *BRUNELLA* L. SELF HEAL.

Low perennial herbs, the nearly simple stems terminated by a short-spicate or subcapitate inflorescence, each whorl composed of six subsessile flowers and subtended by broad floral bracts. Calyx reticulate-veiny, membranaceous or chartaceous, bilabiate; upper lip truncate with 3 cusps; lower 2-cleft; lips closed in fruit. Corolla-throat inflated and tube more or less exserted; upper lip erect, galeate, entire; lower lip 3-lobed, the middle lobe hanging downward. Stamens 4, in pairs under the upper lip, each filament or those of the upper with a small tooth below the anther. Nutlets smooth and glabrous. (Derived from the Old German *breune* or *braune*, an affection of the throat, which Self Heal was used to cure.)

1. *B. vulgaris* L. Four to 10 in. high, green and nearly glabrous; leaves oblong to ovate-lanceolate, obscurely serrate, 1 to 3 in. long, petioled; corolla violet, pinkish or rarely white, exceeding the purplish calyx; middle lobe of lower lip with setaceous incised margin.

Woods of low hills and valleys near the coast: Marin Co., Knights Valley and north to Humboldt Co. June.

7. *STACHYS* L. HEDGE NETTLE.

Ours hispid or soft-pubescent herbs with the flowers few in the axils of the floral leaves, usually forming an interrupted spicate inflorescence. Calyx tubular-campanulate or turbinate, 5 to 10-nerved or -ribbed, with 5 nearly erect or spreading pointed equal teeth, sometimes the upper larger and more or less united. Corolla with cylindrical tube, not dilated at the throat; upper lip erect or slightly turned backward, over-arched or concave, entire or notched; lower lip longer, spreading, 3-lobed, the middle lobe larger, the lateral lobes often deflexed. Stamens 4, in pairs, ascending under the upper lip of the corolla, or one or both pairs sometimes deflexed to the sides of the throat and contorted after anthesis. Nutlets obtuse at the apex. (Greek *stachys*, an ear of corn, hence a spike; given to these plants on account of their spicate inflorescence.)

Corolla-tube not exceeding the calyx or not very greatly.

Flowers whitish.

Whorls forming a dense spike; herbage very hirsute.....1. *S. pycnantha*.

Whorls distinct or indistinct, the inflorescence 3 to 9 in. long; herbage white-woolly... 2. *S. albens*.

Whorls distinct, the inflorescence 2 to 4 in. long; herbage villous or silky-hirsute..... 3. *S. ajugoides*.

Flowers purplish; stems retrorsely hispid or hirsute, especially on the angles.

Hairy ring at middle of corolla-tube very oblique.....4. *S. bullata*.

Hairy ring near base of corolla-tube horizontal.....5. *S. californica*.

Corolla-tube much longer than the calyx, the corolla red.....6. *S. chamissonis*.

1. *S. pycnantha* Benth. Erect, $\frac{3}{4}$ to $1\frac{1}{4}$ ft. high; herbage mostly green but hirsute, the surface of the leaves somewhat granulate-glandular; leaves ovate to oblong-ovate, 1 to 4 in. long, obtuse or subcordate at base, mostly petioled; flowers in a dense cylindraceous bractless or nearly bractless spike 1 to 2 in. long; lowest whorls rarely separate; calyx-teeth deltoid, mucronate, commonly equaling the tube.

Rather uncommon: West Berkeley; Tiburon and southward to Monterey.

2. *S. albens* Gray. Stems erect, strict, 2 to 5 ft. high; herbage white-tomentose; leaves ovate to lanceolate, obtuse or cordate at base, mostly the very lowest short-petioled; whorls many-flowered, mostly indistinct and spicate, only the lowest whorls, if any, somewhat remote, the inflorescence 3 to 9 in. long; calyces often somewhat yellow-green, the teeth awn-pointed.

Along rivulets or near springs in the dry inner Coast Ranges: Lake Co. to Pacheco Pass. July-Aug.

3. *S. ajugoides* Benth. Stems mostly erect, simple, 8 to 24 in. tall; herbage densely soft-pubescent, sometimes glabrate; leaves oblong, 1 to $2\frac{1}{4}$ in. long, acute or obtuse below, petioled, the upper sessile; one or two flower clusters below rather remote and in the axils of upper ordinary leaves, the leaves above becoming bract-like and the clusters less remote; calyx short-campanulate or turbinate, very silky-villous, often concealing the teeth; hairy ring below middle of corolla-tube very oblique, the tube slightly constricted below.

Everywhere common in low lands in the Coast Ranges and Sacramento and San Joaquin valleys. May-Aug. Var. *STRICTA* Jepson; small resin-glands abundant beneath the short pubescence on the leaves; leaves thinnish, ovate-lanceolate or oblong, 3 to $3\frac{1}{2}$ in. long, only the uppermost sessile; calyx-teeth erect or somewhat connivent around the tube of the corolla; upper lip of corolla very short; corolla-tube without evident constriction, the ring of hairs horizontal, not oblique.—Knights Valley. Var. *VELUTINA* Jepson; pubescence short and close; leaves cordate-ovate; spike elongated, interrupted.—Suisun Marshes. Oct. This variety forms a transition to the preceding species.

4. *S. bullata* Benth. Stems simple from the base or branched above, erect or ascending, 10 to 22 in. long; foliage densely or sparsely hispid, the stems retrorsely hispid, especially on the angles; leaves oblong-ovate, sometimes varying to elliptic, coarsely crenate, truncate or subcordate at base, 1 to 2 or even $3\frac{1}{2}$ in. long, the lower on petioles 1 to 2 in. long; flowers about 6 in a whorl, the whorls rather remote (mostly 6 to 12 lines apart); calyx turbinate or campanulate-turbinate, the teeth triangular, cuspidate, in age spreading, somewhat indurated; corolla-tube 4 lines long, exerted about 1 line, bearing within at its middle an oblique ring of hairs interrupted on the upper side opposite the style and indicated exteriorly by a distinct although only partial constriction; filaments densely pubescent at the middle.

The most common species, found everywhere among the low hills of the Coast Ranges. Mar.-Apr. When the flowers first open and the stamens stand

erect, the lower pair of stamens are at that time distinctly although but slightly longer than the upper.

5. *S. californica* Benth. Slender, 2 to 4 ft. high; leaves ovate-oblong, ample, subcordate at base, sparsely villous-hispid; corolla-tube exceeding the calyx, nearly twice as long; hairy ring at base of tube horizontal.

Santa Cruz Mts., in shady woods. June.

6. *S. chamissonis* Benth. Several ft. high, the angles of the stems retrorsely scabrous, the hairs pustulate; leaves soft-pubescent, ovate, 3 or 4 in. long; calyx $\frac{1}{2}$ in. long, clavate-tubular, much shorter than the tube of the red corolla; hairy ring near base of corolla-tube.

Near the coast: San Francisco; Sausalito; Bolinas Bay; Pt. Reyes and northward.

LAMIUM AMPLEXICAULE L. Giraffe Head. Low annual, decumbent at base; internodes below the inflorescence very long; leaves rounded, toothed or lobed, the lowest petiolate, the floral sessile; calyx with 5 nearly equal awn-pointed teeth, much surpassed by the elongated corolla-tube; upper lip of corolla bearded, lower spotted.—Sonoma Co.; Napa Valley (Mrs. D. O. Hunt, who invented the common name); Mt. Eden.

8. SALVIA L. SAGE.

Herbs or low shrubs with the flowers usually in whorls, forming terminal racemes or spikes, the floral leaves mostly reduced to bracts. Calyx bilabiate, the upper lip entire or 3-toothed, the lower 2-cleft. Corolla with the upper lip erect, straight, concave or falcate, sometimes obsolete; lower lip spreading, 3-lobed, the middle lobe often emarginate, cleft or fringed. Stamens inserted in the throat of the corolla; lower pair fertile; upper pair obsolete or represented by sterile filaments or vestiges; anther-cells widely separated on a long filament-like connective longer than the filament itself and jointed to it by the middle or near one end; connective at its upper end (under the upper lip of the corolla) bearing a perfect anther-cell, at its lower end a deformed anther-cell or the anther-cell obsolete. In some species the filament is seemingly simple, but is really jointed, thus indicating the presence of the connective, the lower end of which sometimes projects as a subulate point but without a trace of an anther-cell. (Latin, *salveo*, to save, some of the species being officinal.)

Lower end of connective bearing a deformed anther-cell or a rudiment; flower-whorls few; annuals.

Herbage white-woolly; bracts much surpassing the flowers; upper calyx-lip 3-toothed, the lateral distant from the middle one.....1. *S. carduacea*.

Herbage green; bracts not exceeding the flowers; teeth of upper calyx-lip 2, awned, partly connate.....2. *S. columbariae*.

Lower end of connective reduced to a subulate point of slender thread, the filament apparently simple; flower-whorls several; perennials.

Corolla white, whitish, or violet-tinged.

Low shrub; middle lobe of lower lip of corolla emarginate, otherwise entire; upper lip present.....3. *S. mellifera*.

Low matted herb, only the scape-like flowering stems ascending; middle lobe of lower lip of corolla denticulate or fringed; upper lip obsolete.....4. *S. sonomensis*.

Corolla crimson, $1\frac{1}{4}$ in. long or more; herbaceous, stems erect.....5. *S. spathacea*.

1. *S. carduacea* Benth. THISTLE-SAGE. Stems 1, 2 or 3 from a rosette of radical leaves, naked and scape-like, bearing 1 to 4 whorls of flowers, 4 in. to 2 ft. high; herbage white-woolly, particularly in the flower-whorls, the wool more or less deciduous; leaves oblong in outline, pinnatifid, with spinulose-dentate margin, the radical 6 in. long or less; bracts ovate-lanceolate or lanceolate, pectinate-spinescent, surpassing the flowers; calyx long-woolly, its

upper lip strongly 3-toothed, the middle tooth larger, the lateral distant, much surpassing the lower lip; corolla light blue, deeply 2-lipped, 1 in. long; upper lip 2-cleft, the segments lacinate or denticulate at the end; lower lip with small crose lateral lobes and an exceedingly large fan-shaped and laciniately fringed middle lobe; proper filament very short.

Inner South Coast Range valleys (Contra Costa Co. and southward) and throughout the San Joaquin Valley; Southern California. June.

2. *S. columbariae* Benth. CHIA. Stems usually several from the base, commonly simple and bearing 1 or 2 pairs of leaves and 1 or 2 whorls of flowers, occasionally branching; herbage finely pubescent, dark green; leaves mostly radical or subradical, bipinnatifid, very rugose, petioled; bracts ovate or more commonly orbicular and broader than long, abruptly acuminate and cuspidate-tipped, not exceeding the flowers, often purple; fruiting calyx 5 lines long, oblique at the throat; upper lip arched, crowned with a pair of needle-like prickles, the prickle representing the middle tooth wanting (or very minute); lower lip very much shorter, the teeth represented by 2 shorter prickles; corolla blue, little exceeding the calyx; upper lip emarginate; lower lip with small lateral lobes and a larger somewhat 2-lobed middle one.

Throughout the Coast Ranges, Sierra Nevada, and Southern California, on hill and mountain slopes. Apr.-May. An infusion of the seeds was valued by the Mission fathers as a remedy for fevers; the seeds also furnished the "finest poultice for gunshot wounds." The Pomos roasted the seeds and ground them into a meal for food.

3. *S. mellifera* Greene. BLACK SAGE. Shrubby, 3 to 6 ft. high, with herbaceous flowering branches very leafy at the base; leaves narrowly oblong, petioled, $1\frac{1}{2}$ to 3 in. long, crenulate, green and rugulose above, cinereous-tomentulose beneath; flowering branches with about 5 rather small flower-whorls; leafy bracts oblong or ovate, those subtending the upper whorls much reduced; proper bracts ovate or oblong, cuspidate; lower lip of calyx very short, the 2 teeth prickly; upper lip arched, crowned by 3 short sharp teeth; corolla white or slightly lilac-tinged and rather small, its tube long, exserted; upper lip notched; middle lobe of lower lip transversely oblong or orbicular, emarginate and slightly denticulate, joined to the main part of the lip by a narrow constriction; style and stamens little exserted; lower portion of connective in fertile stamens manifest at the joint as a subulate rudiment; upper pair of stamens represented by short sterile filaments, their tips approximate.—(*Audibertia stachyoides* Benth.)

Mt. Diablo and Santa Cruz Mts. southward. Apr.-May. An important bee-plant in Southern California; also called Ball Sage, Button Sage and Blue Sage.

S. APIANA Jepson. White Sage. Shrubby, 3 to 5 ft. high, the branches virgate; leaves mostly very white above and below; corolla white, its tube very short; style and stamens long-exserted.—Southern California, very abundant and a famous bee-plant, producing a white honey.—(*S. californica* Jepson. *Audibertia polystachya* Benth.)

4. *S. sonomensis* Greene. CREEPING SAGE. Flowering stems almost leafless and scape-like, 4 to 8 in. high, ascending from a leafy mat-like base; leaves green and rugulose above, whitish with a close dense tomentum beneath, oblong- or obovate-spatulate, crenulate, petioled, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long; calyx like that of *S. mellifera* but the prickly teeth of the larger upper lip short; corolla light violet; upper lip short, of two erect or somewhat retrocurved lanceolate lobes;

lower lip large, much prolonged in the direction of tube, the lateral lobes acute, short, the middle lobe with its orbicular-dilated terminal portion turned abruptly downward, its margin denticulate or somewhat fringed; upper (sterile) stamens inserted at orifice of tube, bristle-like, divergent; two lower (fertile) stamens inserted on lower lip without the orifice, ascending, straight (nearly as long as the corolla); style long exserted.—(*Audibertia humilis* Benth.)

Montane species at middle altitudes, rare but widely distributed in the Coast Ranges and Sierra Nevada from Mt. Shasta to San Diego Co. Also called Ramona. May.

5. **S. spathacea** Greene. CRIMSON SAGE. Coarse herb with erect simple stems $1\frac{1}{2}$ to 2 ft. high, very viscid and glandular-pubescent or villous; leaves broadly oblong-ovate, with broadly triangular-cordate base, more or less doubly crenate or crenulate, upper surface dark green and rugulose, under surface whitened with a close short tufted tomentum, 4 to 8 in. long, on petioles 2 or 3 in. long or some of the cauline sessile; whorls of flowers 5 or 6 or more, subtended by broadly ovate or ovate-lanceolate membranous purplish bracts; calyx strongly veined, laterally compressed but somewhat inflated, 1 in. long or over, $\frac{1}{2}$ in. wide at the broadest part, spathe-like, deeply slit in front between the two cuspidate-tipped teeth, the upper concave lip much larger, 3-dentate with the middle tooth largest; corolla crimson, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long; upper lip short, nearly erect, emarginate; lower lip spreading, the lateral lobes short, triangular, acute, the middle lobe much developed, broadly obovate, 4 lines broad; stamens much exserted; lower fork of the connective capillary, 1 line long; rudiments of sterile stamens obvious.—(*Audibertia grandiflora* Benth.)

Coast Ranges from the Vaca Mts. and Mt. Diablo southward to Southern California. Apr.-May. A fine plant. Also called Humming-bird Sage.

9. ACANTHOMINTHA Gray.

Annuals with dentate leaves and flowers in distinct or at length remote whorls, each whorl subtended by a pair of leaves and a circle of broad callous-margined bracts armed with needle-like prickles. Calyx bilabiate; upper lip 3-toothed, the teeth aristate; lower lip short, 2-cleft into oblong acute lobes. Corolla-tube exceeding the calyx, naked within; upper lip entire, oblong; lower lip 3-lobed, the middle lobe deeply and the lateral slightly emarginate. Stamens 4, inserted high in the ample throat; lower pair fertile; upper pair shorter with imperfect anthers. Nutlets smooth. (Greek *acantha*, thorn, and *mentha*, mint.)

1. **A. lanceolata** Curran. Stoutish, branching from the base, soft-pubescent, oily and ill-scented, 7 to 12 in. high; leaves oblanceolate or oblong, sparingly dentate, tapering at base into a slender petiole; bracts elliptic-ovate, 5 lines long, the aristate prickles 3 or 4 lines long; upper lip of corolla somewhat falcate-incurved, cleft at apex; lower with oblong entire lobes.

Calaveras Valley (Alameda Co.) southward to Mt. Hamilton, Priest Valley and Monterey Co. June. Cf. *Zoe*, iv, 156.

10. POGOYNE Benth.

Low sweet-aromatic annuals with obovate or oblanceolate leaves narrowed into a petiole. Whorls crowded into dense spikes or the lower whorls distinct. Bracts and calyx hirsute. Calyx unequally and deeply 5-cleft, the two lower teeth longer; tube mostly 15-nerved; throat naked. Corolla straight, tubular-funnelform, blue or purplish; upper lip erect, entire; lower spreading, with 3 similar oval lobes. Stamens 4, with anthers, or the upper shorter pair sterile.

Style somewhat exserted, in some (perhaps all) species flattened above and always bearded. (Greek pogon, beard, and gune, female, on account of the hairy style.)

All 4 stamens anther-bearing; corolla large, much longer than calyx; bracts conspicuously ciliate with white hairs.

Bracts linear, acute.....1. *P. douglasii*.

Bracts obtuse.....2. *P. parviflora*.

Lower pair of stamens anther-bearing, the upper with mere rudiments of anthers or none; corolla about equalling (scarcely longer than) calyx; bracts sparsely hairy.

Plants very slender, diffuse.....3. *P. serpylloides*.

Plants stoutish, erect.....4. *P. ziziphoroides*.

1. *P. douglasii* Benth. Commonly low (4 to 6 in. high) and branched from the base, oftentimes simple and as much as 2 ft. high; leaves oblanceolate or obovate and narrowed to a petiole, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; whorls forming a dense terminal spike, often with a single accessory whorl in the adjacent axil below, or sometimes several of the lower axils with flowers; bracts cuspidate, the margin ciliate with white hairs; lower divisions of calyx twice longer than tube; corolla blue, the palate white, dotted with purple, bristly, 7 to 9 lines long; stigmas subequal; nutlets smooth, often mottled, minutely hispid at the apex.

Low summer-dry fields that have been overflowed in the winter season: Coast Range valleys from San Luis Obispo, Pajaro and Mt. Diablo to Napa Co., Santa Rosa, Ukiah, Lake Co. and eastward to the Sierra Nevada foothills. Often coloring large areas in May and June. Style flattened above and hirsute-ciliate on the margins as also in *P. ziziphoroides*.

2. *P. parviflora* Benth. More slender than the preceding; bracts mostly obtuse; calyx-teeth rather broad, the lower barely longer than the tube; corolla scarcely $\frac{1}{2}$ in. long.

About San Francisco Bay.

3. *P. serpylloides* Gray. Stems many from the base, very slender, diffuse; leaves obovate-oval or spatulate, petioled, 2 to 4 lines long; whorls except the terminal ones distinct, the lower with few or even solitary flowers; bracts sparsely hairy; calyx-lobes all longer than the tube, equaling the violet or bluish corolla; corolla $1\frac{1}{2}$ to 2 lines long, short-pubescent outside; sterile stamens with rudiments of anthers or with none; style bearded above with a few coarse hairs; stigmas very unequal.

Monterey to Humboldt Co., common; Sierra Nevada; Southern California. May.

4. *P. ziziphoroides* Benth. Stems short, commonly several from the base, 4 to 6 in. high; leaves obovate; bracts ciliate with white bristly hairs; whorls below distinct, with long internodes, above forming a short spike or sometimes capitate; corolla 3 to 4 lines long (the calyx-teeth distinctly shorter), light purple, the center of lower lip with white and dark purple markings; 2 lower stamens with large anthers, the 2 upper with very small anthers or none and with shorter filaments; stigmas very unequal.

Sacramento Valley in low ground.

11. MELISSA L.

Lemon-scented branching perennial, with broad dentate petioled leaves and white flowers in loose axillary clusters. Calyx narrowly campanulate, 13-nerved, deflexed in fruit; upper lip 3-toothed, the lower 2-parted. Corolla exserted, nearly twice as long as the calyx, bilabiate, the upper lip erect,

notched; lower lip spreading, 3-cleft. Stamens 4, converging under the upper lip. (Greek melissa, a bee, these insects visiting the flowers for honey.)

1. *M. officinalis* L. GARDEN BALM. Stems somewhat decumbent at base, $\frac{1}{4}$ to 2 ft. high; stems and petioles short-villous; leaves hispidulous above, truncate at base, $2\frac{1}{2}$ in. long or less, the petiole $\frac{1}{4}$ to $\frac{1}{2}$ as long; calyx-teeth unequal; corolla 5 lines long.

Sparingly naturalized: Marin Co.; Santa Rosa; Guerneville.

12. MICROMERIA Benth.

Trailing perennial herbs. Flowers small, white, solitary and pediceled in the axils. Calyx tubular, about equally 5-toothed and striately 12 to 15-nerved. Corolla bilabiate, the tube straight, shorter than or exceeding the calyx. Stamens 4, all anther-bearing, shorter than the corolla. Style beardless. (Greek mikros, small, and meros, part, on account of the small size of the flowers.)

1. *M. chamissonis* (Benth.) Greene. YERBA BUENA. Stems slender, 1 ft. or more long; herbage slightly pubescent; leaves round-ovate, crenate, glandular-punctate, especially on the under surface, $\frac{1}{2}$ to 1 in. long or less, on petioles 2 to 3 lines long; flowers about 4 lines long; calyx and corolla exteriorly short hairy; lower pair of stamens longer.—(*M. douglasii* Benth.)

Common in woods near the coast: Humboldt Co.; Marin Co.; Berkeley; San Francisco; Belmont; Monterey and southward to Southern California. June. Lower pair of stamens longer. Rooting by stolons.

13. SPHACELE Benth.

Low shrub or merely suffrutescent. Flowers solitary in the axils of the reduced upper leaves thus forming a leafy raceme. Calyx campanulate, deeply and nearly equally 5-toothed, naked within, about 10 to 15-nerved, reticulate-veiny, conspicuously inflated and membranous after flowering. Corolla large and rather showy, with 4 short spreading lobes, the fifth and lowest lobe much longer and erect; tube broad, a hairy ring at base within. Stamens 4, somewhat ascending; filaments naked; anthers somewhat approximate, the cells diverging. (Sphakos, the name of the Greeks for Sage, the plants of this genus having similar foliage.)

1. *S. calycina* Benth. PITCHER SAGE. Erect, 3 or 4 ft. high, pubescent or even somewhat woolly; leaves very veiny or scarcely reticulated, broadly ovate to oblong-ovate, obtuse, dentate or serrate, the base entire and varying from cordate to acute, 2 to 4 in. long, the lower on petioles $\frac{1}{2}$ in. long, the uppermost sessile; corolla white or pink-tinted, over 1 in. long; calyx with triangular-lanceolate lobes, in fruit ovoid-inflated, $\frac{3}{4}$ to over 1 in. long; nutlets black, finely pubescent but smooth, elliptical in outline, nearly 2 lines long.

Hillsides and cañons of the Coast Ranges: Vaca Mts.; Marin Co.; Mt. Diablo; Belmont; Monterey and southward to Southern California. May-June. On the higher ridges the leaves are small and very rugose.

14. KOELLIA Moench. MOUNTAIN MINT.

Glabrous or canescent perennial herbs with white flowers in densely crowded whorls, the whorls remote and leafy-bracted or the uppermost subtended by a pair of somewhat reduced leaves. Calyx oblong or tubular, its teeth equal. Corolla-tube little exceeding the calyx; upper lip almost entire; lower 3-cleft. Stamens 4, nearly equal. (Koelle, a German botanist of the 18th century.)

1. *K. californica* (Torr.) Kuntze. Simple, erect, 2 to $3\frac{1}{2}$ ft. high; leaves

ovate to ovate-lanceolate, sessile, serrulate along the sides, the acuminate apex and rounded or cordate base entire, $3\frac{1}{2}$ in. long or less; calyx pubescent, the tips of the teeth very woolly exteriorly; corolla sprinkled exteriorly with resin dots, its throat hairy.—(*Pycnanthemum californicum* Torr.)

Sierra Nevada and Coast Ranges. July-Aug.

15. MONARDELLA Benth.

Annual or perennial herbs, for the most part pleasantly fragrant. Flowers in heads; heads terminal on the stems or branches, subtended by broad involucre bracts, which are often more or less colored. Calyx tubular, narrow, 15-nerved, the 5 teeth equal or nearly so. Corolla glabrous within, rose-purple, lavender or dull white; upper lip erect, 2-cleft, the lower 3-parted, all the lobes linear or narrowly oblong. Stamens 4, all fertile, strongly or moderately unequal, exserted, distant and straight. (Diminutive of *Monarda*, on account of its resemblance to that genus.)

Annuals.

Leaves entire; interior species or at least not of the seaward ranges.

Bracts with strong transverse ribs from the midrib to the conspicuous marginal nerve, the spaces between the ribs silvery-scarious or transparent; corolla-tube little exserted.....1. *M. douglasii*.

Bracts whitish-scarious, the ribs converging toward the apex, at least in the inner bracts; corolla-tube much surpassing the calyx.....2. *M. breweri*.

Leaves undulate; seacoast species3. *M. undulata*.

Perennials.

Leaves ovate to lanceolate, green on both faces, mostly serrate.....4. *M. villosa*.

Leaves rhomboidal to oblong, green on the upper, white on the lower face, entire.....5. *M. viridis*.

1. *M. douglasii* Benth. Four to 10 in. high, nearly glabrous, loosely branched; leaves narrowly oblong or lanceolate, abruptly short-petioled, the whole about 1 in. long; heads on terminal or axillary peduncles; bracts ovate and ovate-lanceolate, cuspidate, with strong pinnate ribs which are confluent along the margin, the spaces between them silvery-scarious; corolla deep purple, the tube little exserted beyond the cuspidate triangular-lanceolate calyx-teeth.

Gilroy Valley; Alameda and Contra Costa cos. Remarkable for its fenestrate bracts.

2. *M. breweri* Gray. Six in. high, finely scabrous-pubescent; leaves oblong or narrowly ovate, short-petioled, the lower over 1 in. long; bracts broadly ovate, abruptly acuminate-cuspidate, whitish-scarious, the outer pinnately 7 to 9-ribbed, the inner with the ribs parallel and converging to the point; calyx-teeth triangular-lanceolate, not cuspidate; corolla rose-color or rose-violet, the tube much surpassing the calyx.

Corral Hollow (inner South Coast Ranges), "plant very fragrant," *Brewer*.

M. LANCEOLATA Gray. Mustang Mint. Simple or sparingly branched above, $\frac{3}{4}$ to $2\frac{1}{2}$ ft. high; bracts herbaceous, often turning reddish; calyx-teeth merely acute; corolla rose-purple, its lobes very long and narrow.—Sierra Nevada foothills and middle altitudes. *M. CANDICANS* Benth. Bracts ovate, with parallel greenish nerves and white-scarious margins; calyx-teeth white, acute, flowers white.—Sierra Nevada foothills. *M. LEUCOCEPHALA* Gray. Very similar to the last, but the bright white bracts are more nearly orbicular and the calyx-teeth are subulate, rough-hispidulous, and recurved.—Merced plains of the San Joaquin Valley.

3. *M. undulata* Benth. Loosely branched, 5 to 9 in. high; stems reddish brown, puberulent; leaves thickish, oblong-oblancoate or linear, obtuse, nar-

rowed at base, undulate-margined, $1\frac{1}{4}$ in. long or less; bracts villous, broadly ovate or almost round, thin, and somewhat scarious, whitish or pinkish, obtuse or acute, without cross veinlets between the parallel nerves; calyx-teeth triangular, or somewhat oblong, not cuspidate; corolla rose-purple.

Hills near the sea: Pt. Reyes, San Francisco and southward to Southern California. June.

4. **M. villosa** Benth. COYOTE MINT. Stems mostly simple, clustered, tough or somewhat suffrutescent at base, $\frac{3}{4}$ to $1\frac{1}{2}$ ft. high; herbage finely pubescent; leaves green on both faces, round-ovate to lanceolate, entire or more commonly serrate, $\frac{1}{2}$ to 1 in. long, on petioles 2 or 3 lines long; bracts ovate, foliaceous, pinnately veined; flowers purple to pink, or dull white.

Coast Ranges on dry rocky hills; in typical form near the sea, San Francisco, Monterey and Santa Lucia Mts. Varying greatly in pubescence, foliage and general aspect. Var. **INTERIOR** Jepson. Leaves coarsely few-toothed, the teeth sometimes salient; heads large.—Vaca Mts.

5. **M. viridis** Jepson. Suffrutescent, diffuse, the stems 2 or 3 ft. long; leaves rhomboidal to oblong-obtusish, narrowed at base to a slender petiole, the whole $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, bright green on the upper face, white-lanate on the lower; heads on long and almost naked peduncles; bracts thick; flowers lavender-color.

Napa Range.

16. **LYCOPUS** L. WATER HOREHOUND.

Perennials of low grounds or river marshes, similar to *Mentha*, but bitter and much less aromatic. Flowers small, white or whitish, in sessile capitate glomerules, apparently whorled, the upper axils flowerless. Calyx campanulate, 4 to 5-toothed (naked in the throat). Upper lobe of corolla entire. Fertile stamens 2, the upper pair without anthers, the tips of the filaments in ours thickened. Nutlets with thickened margins. (Greek lukos, wolf, and pous, foot, perhaps on account of the shape of the leaves in the original species.)

Leaves petioled, irregularly and incisely toothed.....1. *L. americanus*.
Leaves sessile, regularly serrate.....2. *L. lucidus*.

1. **L. americanus** Muhl. Stem erect, branching above, 2 to 3 ft. high, very acutely 4-angled, from creeping rootstocks, not bearing stolons; herbage nearly glabrous; leaves broadly or narrowly lanceolate, incisely toothed or laciniate-pinnatifid, narrowed at base into a slender petiole, $1\frac{1}{2}$ to 2 in. long; calyx-teeth acute; rudiments of sterile stamens conspicuous; inner angle of nutlet granulose at apex.—(*L. sinuatus* Ell.)

Lower Sacramento River; San Francisco. Sept.-Oct.

2. **L. lucidus** Turcz. Stems stoutish, not so sharply angled, perennial by stolons; leaves broadly or narrowly oblong, coarsely and incisely toothed, sessile, the lower 3 in. long and $\frac{3}{4}$ in. wide, the upper reduced; calyx-teeth attenuate-subulate.

Salt marshes; Saisun; Benicia; San Francisco. Aug.

17. **MENTHA** L. MINT.

Very odorous perennial herbs, mostly with slender creeping rootstocks, usually tomentose or hairy and with rather small flowers in whorls, which are either remote or spicate or capitate. Calyx campanulate or short-tubular, commonly 5-toothed, nearly regular, or bilabiate. Corolla with a short tube; upper lip emarginate, scarcely or not at all larger than the 3-lobed lower

one. Stamens 4, erect and nearly equal. Nutlets smooth. (Ancient Greek name.)

Flower-whorls in the leaf axils, distinct.

Herbage commonly light green; branches leafy to the ends; calyx-teeth similar and equal or nearly so.....1. *M. canadensis*.

Herbage somewhat grayish; leaves toward the end of the branches reduced and inconspicuous; calyx-teeth dissimilar, the 2 lower lanceolate-subulate.....2. *M. pulegium*.

Flower-whorls in terminal spikes or some in the upper leaf axils.

Leaves petioled; spikes thick, dense or little interrupted.....3. *M. piperita*.

Leaves sessile or nearly so; spikes slim, mostly interrupted.....4. *M. spicata*.

1. *M. canadensis* L. TULE-MINT. Perennial by suckers; stems often several ft. long, simple or much branched; herbage tomentose-pubescent, sometimes almost hoary, more commonly greenish; leaves oblong-lanceolate, sharply serrate, tapering at base into a petiole, $1\frac{1}{2}$ to 2 in. long; whorls of flowers often shorter than the petioles of the leaves; calyx pubescent, its teeth $\frac{1}{4}$ to $\frac{1}{3}$ as long as the tube.—(*Hedeoma purpurea* Kell. *Micromeria purpurea* Gray.)

Common in marshes: lower Sacramento and lower San Joaquin; San Francisco Bay. Aug.-Sept. Cymes sometimes raised out of the axils on peduncles.

2. *M. pulegium* L. PENNYROYAL. Stems 1 to 2 ft. long, erect or prostrate and rooting at the joints; herbage pubescent with short white hairs; leaves elliptic to oblong-ovate, serrate or entire, petioled, $\frac{1}{2}$ to 1 in. long; whorls dense, the leaves smaller or inconspicuous towards the ends of the branches; 3 upper calyx-teeth triangular, acute; 2 lower lanceolate-subulate, ciliate-bristly.

Introduced European mint: Sonoma Co.; Marin Co.; islands of the lower San Joaquin.

3. *M. piperita* L. PEPPERMINT. Stems erect, strict and unbranched below the terminal inflorescence; herbage glabrous; leaves ovate-oblong to oblong-lanceolate, acute, sparsely and sharply serrate, distinctly petioled; spikes dense, scarcely interrupted; calyx resinous-glandular; corolla white with a pink tinge.

Along streamlets in low fields: Berkeley; Haywards; Alvarado. Sept. Naturalized from Europe.

4. *M. spicata* L. SPEARMINT. Similar to the preceding; leaves sessile or subsessile; flower-whorls crowded; spikes very narrow, leafless, commonly interrupted; calyx campanulate, its teeth subulate, nearly as long as tube.—(*M. viridis* L.)

Rather common in wet places: Berkeley; Napa Valley; Lake Co. Naturalized from Europe.

SOLANACEAE. NIGHTSHADE FAMILY.

Ours herbs with alternate leaves. Flowers complete and regular. Peduncles terminal or axillary, bearing an umbel, cyme or panicle, or a solitary flower. Calyx 5-cleft or toothed, usually persistent. Corolla 5-lobed, the lobes valvate or imbricate and mostly plicate in the bud. Stamens 5, inserted on the corolla and alternate with its divisions. Ovary superior, 2-celled; style 1; stigma entire or sometimes 2-lobed. Fruit a berry or capsule.—*Datura* has a falsely 4-celled capsule. *Nicotiana glauca* is a soft-woody shrub. (A family distinguished on the whole by its poisonous or acrid properties; includes such cultivated plants as *Chilies*, *Cayenne Pepper*, *Tomato*, *Potato*, *Ground Cherry*, *Bitter-sweet*, *Belladonna*, and *Petunia*.)

Corolla tubular or funnelliform; fruit a capsule.

Capsule 2-celled, smooth; flowers in a terminal panicle.....1. *NICOTIANA*.
 Capsule falsely 4-celled, prickly; flowers solitary, very large.....2. *DATURA*.
 Corolla rotate; fruit a berry; flowers in umbels or cymes.....3. *SOLANUM*.

1. *NICOTIANA* L. TOBACCO.

Heavy scented usually viscid-pubescent herbs (except one) with entire leaves and panicle flowers. Calyx persistent, more or less investing the fruit, 5-toothed or -lobed. Corolla funnelliform or salverform, plicate and somewhat imbricate in the bud. Filaments filiform, mostly included. Ovary 2-celled, with large and thick placentae. Fruit a smooth 2-celled capsule, septicidal, and the valves promptly 2-cleft at apex, thus seeming as if 4-valved. Seeds small, numerous. (Jean Nicot, 1530-1600, French diplomat and author of the most ancient dictionary of the French language, but more celebrated as having introduced tobacco into France from Portugal.)

Annuals; flower white.

Cauline leaves sessile; calyx-teeth as long as tube; corolla-limb broad....1. *N. bigelovii*.
 Cauline leaves petioled; calyx-teeth commonly short, $\frac{1}{4}$ to $\frac{1}{2}$ as long as tube; corolla-limb narrow2. *N. attenuata*.
 Shrub; flowers yellow; throat of corolla constricted under the narrow limb..3. *N. glauca*.

1. *N. bigelovii* Wats. Stem simple at base and branched above, or branched near the base, $1\frac{1}{2}$ to 2 ft. high; herbage with glandular indument, very ill-smelling; radical leaves oblong-ovate, acute, petioled; cauline similar, sessile (the lower sometimes petioled), often contracted above the middle into a lanceolate apex, the uppermost lanceolate; flowers few, mostly remote along the branches; calyx with slender teeth as long as the tube; corolla-tube $1\frac{1}{2}$ in. long, the limb 1 in. wide; filaments unequally inserted high in the tube, glabrous; capsule obtuse, shorter than the calyx.

Flood-plains of rivers and open valley floors from the North Coast Ranges and Sacramento Valley southward to Southern California. Flowers closing during the day and opening in the evening. This and the next used by the Indians as a smoking tobacco; some of the tribes certainly cultivated it, this being their only strictly agricultural practice.

2. *N. attenuata* Torr. Habit of the preceding; glandular-pubescent and odorous much as the preceding; lower leaves broadly ovate, the upper varying to narrowly lanceolate, all petioled; flowers many, disposed in clusters along and terminating the branches; calyx-teeth triangular-lanceolate, $\frac{1}{4}$ or $\frac{1}{2}$ the length of the calyx-tube, rarely subulate and as long; corolla-tube 1 in. long, with narrow limb 3 to 5 lines in diameter; filaments equally inserted low down in the tube, pubescent below the middle; capsule longer than the calyx, at least in the forms with short calyx-teeth.

Common throughout California, especially towards the interior and southward. July-Nov. Vespertine as the last.

3. *N. glauca* Graham. TREE TOBACCO. Soft-woody evergreen shrub 6 to 15 ft. high, very slender and loosely branching, with glabrous and glaucous herbage; leaves ovate, entire, 8 in. long, on petioles 4 in. long; uppermost leaves reduced, ovate to oblong; flowers in terminal panicles; calyx unequally 5-toothed, $1\frac{1}{2}$ in. long; corolla $1\frac{1}{2}$ in. long, its tube dilated above summit of the calyx, the stamens inserted at this point; throat of corolla constricted just below the short shallowly 5 (occasionally 4)-lobed limb; anthers and stigma in throat of corolla; ovary seated on a yellowish disk; capsule oblong, $\frac{1}{2}$ in. long.

Introduced from southern South America and becoming common in waste

places about interior towns and along the flood-beds of interior streams: Alamo Creek; Napa Valley; south to the Little Sur River, thence east to the Arroyo Los Gatos near Coalinga and throughout the San Joaquin. Herbage more or less poisonous to cattle.

2. DATURA L. THORN-APPLE.

Coarse rank-smelling herbs. Leaves large, ovate, mostly sinuate-dentate, petioled. Flowers large, solitary on short peduncles in the forks of the branching stem. Calyx tubular, 5-toothed, in our species at length cutting through near the base, the lower part persisting as a collar or rim beneath the capsule. Corolla funnellform with ample limb, convolute-plicate in the bud. Stamens included; filaments long. Stigma bilamellate. Capsule prickly or spiny, 4-valved from the top or the valves indefinite. The placentae project from the axis into the middle of the cells and connect with the walls by a partition imperfect at the top and thus form a falsely 4-celled ovary and capsule. (The Hindoo name, dhatura.)

Calyx not prismatic, tubular; corolla large (6 to 8 in. long); capsule nodding on the short recurved pedicel, indefinitely valved or bursting irregularly, the subtending persistent base of the calyx rotate1. *D. meteloides*.
Calyx prismatic; corolla small (4 in. long or less); capsule erect, definitely 4-valved, the subtending persistent base of the calyx reflexed.
Corolla purple; prickles subequal.....2. *D. tatula*.
Corolla white; prickles very unequal.....3. *D. stramonium*.

1. *D. meteloides* DC. TOLGUACHA. Erect branching plant, 2 or 3 ft. high; calyx with 5 lanceolate teeth; corolla white, tinged with violet, its limb 3 to 6 in. wide, provided with 5 slender teeth $\frac{1}{2}$ to $\frac{3}{4}$ in. long; anthers white, 6 lines long; capsule globose, 1 in. long, densely prickly, indefinitely valved or bursting irregularly, the calyx-rim rotate about base of the capsule; prickles short (often only 2 lines long), dilated and pubescent at base; seeds 2 lines long, light-colored, flat, smoothish, with a cord-like margin.

Sandy valley lands; Sacramento Valley to Southern California, thence eastward. The active poison was used by some of the native tribes, the whole plant being ground up and mixed with water to form a drink.

2. *D. tatula* L. PURPLE THORN-APPLE. Plants 1 to 2 ft. high; stems purplish; corolla purplish, 3 to 4 in. long, the limb 2 in. wide or less; anthers purple, 2 lines long; capsule ovoid, with many very stout subequal prickles; calyx-rim reflexed from base of capsule; seeds thickish, brown, finely pitted and rugose, or with umbilicate markings.

Naturalized from Tropical America; not common but widely distributed: Russian River, Monterey, San Bernardino. More or less poisonous.

3. *D. stramonium* L. STRAMONIUM. Similar to the preceding, but the stems greenish and the flowers white; capsule with few prickles, the lower much shorter than the very stout upper ones which are $\frac{3}{4}$ in. long.

Introduced and widely distributed but not common. Poisonous.

3. SOLANUM L. NIGHTSHADE.

Herbs or sometimes suffrutescent. Flowers in umbels on short lateral or terminal peduncles. Calyx 5-parted. Corolla rotate, 5-lobed, with scarcely any tube. Anthers almost sessile, lightly connate into a cylinder surrounding the style, opening by a small pore at the apex or longitudinally dehiscent. Fruit a berry with several seeds. (Latin name of the Nightshade, from solamen, quieting.)

Annual; peduncles longer than the pedicels; corolla small, 5-cleft.....1. *S. nigrum*.
 Perennial; peduncles much shorter than the pedicels or almost none; corolla larger,
 5-angled or -lobed, with greenish glands at base.

More or less suffrutescent; pubescence tomentose, of branched hairs..2. *S. umbelliferum*.
 Herbaceous or nearly so; pubescence viscid, of simple hairs.....3. *S. xantii*.

1. *S. nigrum* L. var. *douglasii* Gray. BLACK NIGHTSHADE. Low spreading annual often several ft. across, dark green and glabrous, more or less conspicuously scabrous on the angles of the stem; leaves elliptic-ovate, acute, narrowed to a petiole, entire, toothed or angulate-sinuate, 1 to 3 in. long or the very lowest 5 in. long; corolla small, whitish, aging to purplish, 2 to 3 lines broad, its segments oblong-lanceolate and ciliolate toward the apex; filaments and style pubescent; fruiting peduncles $\frac{1}{2}$ in. long or more, bearing 3 to 5 berries on more or less recurved pedicels; berries blue-black, nearly as large as peas, poisonous.

Waste ground, commonly in shade or in moist places, flowering through the summer into early winter. One or 2 flowers of a cluster sometimes have only 4 stamens. Plants from the south (Monterey to Southern California) have corollas 5 lines wide.

S. TUBEROSUM L., the Common Potato, with leaves pinnate and large and minute leaflets intermixed, is occasionally found beyond the boundaries of cultivated fields.

2. *S. umbelliferum* Esch. BLUE WITCH. More or less suffrutescent, 2 to 3 ft. high, the stems deep green, mostly 5-angled or -ridged; herbage finely pubescent-tomentose, the hairs branched; leaves elliptic-ovate, rarely pinnatifid at base, 1 to 2 in. long or less, thickish, on petioles 2 to 3 lines long; peduncles short or almost none; pedicels 4 to 8 lines long; calyx 5-lobed; corolla blue, sometimes white, 10 lines broad, shallowly 5-lobed with 5 pairs of greenish glands near the base; anthers 2 lines long, the filaments merely evident; berry when fully ripe, dull white with a greenish zone toward the base, 4 to 8 lines in diameter.

Hill country of the Coast Ranges, especially along gulches or in cañons toward the coast (apparently not in inner Coast Ranges); Sierra Nevada foothills. May-June, but often flowering all the year.

3. *S. xantii* Gray. Stems herbaceous, several to many from a perennial base, erect or decumbent, mostly simple, slender and sparsely leaved, $1\frac{1}{2}$ to 2 ft. long; pubescence somewhat viscid and of simple hairs; leaves thinnish, elliptic-ovate, at base obtuse, truncate or subcordate, on petioles 5 lines long or less; flowers few in an umbel, light azure or fading darker blue, 5 to 6 lines in diameter.

Vaca Mts. to Southern California, where common, the flowers a full inch in diameter; also in the Sierra Nevada at middle elevations. Mar.-May.

SCROPHULARIACEAE. FIGWORT FAMILY.

Ours herbs excepting *Diplacus* and some species of *Pentstemon* and *Castilleja*. Leaves simple, entire or toothed, rarely parted or pinnatifid. Flowers complete. Stamens 4, in 2 pairs (one pair shorter than the other), or one pair sterile, or stamens 2 only, always inserted on the corolla. Verbasum has 5 perfect stamens and in several genera the fifth stamen is present as a sterile filament or rudiment. Corolla commonly bilabiate (sometimes nearly regular and 4 or 5-lobed); upper lip 2-lobed or with a snout-like, hooded or hooked prolongation (galea); lower lip 3-lobed, frequently 3-saccate. Calyx synsepalous or sometimes chorisepalous. Ovary superior, 2-celled; style 1; stigma 2-lobed or entire. Fruit a 2-celled, 2-valved capsule, with septicidal or locu-

leicidal dehiscence, or opening near the apex by pores; seeds numerous or often few, with a minute mostly straight embryo in abundant endosperm.—An important family biologically, the species in California numerous, and many of them the showiest of West-American plants. All of the Californian genera are represented in the region of San Francisco Bay save the monotypic annual *Mohavea*, of the Mohave Desert; this allied to *Antirrhinum* but fertile stamens only 2. Few extra-limital species are here noted, since as a whole they are to be recognized only by critical marks.

A. Leaves alternate; anther-bearing stamens 5.

Corolla nearly regular, rotate, with short tube; filaments (or some of them) very hairy..
1. VERBASCUM.

B. Leaves opposite, or the upper sometimes alternate; anther-bearing stamens less than 5.

Corolla with a spur or sac at base of tube on lower side, often with a prominent palate nearly closing the throat; stamens 4, all with anthers; capsule opening by pores or chinks near the apex.

Corolla-tube with a sac at base; palate closing the throat.....2. ANTIRRHINUM.

Corolla-tube with a spur at base; palate seldom closing the throat.....3. LINARIA.

Corolla without spurs or sacs at base of tube, bilabiate to nearly regular; upper lip not galeate; capsule valvate.

Stamens with anthers 4; fifth stamen present as a sterile filament, scale, or mere gland.

Annuals; fifth stamen present as a rudiment or gland.

Corolla strongly declined, strongly bilabiate; middle lobe of lower lip folded lengthwise into a sac enclosing the stamens and style.....4. COLLINSIA.

Corolla minute, little declined, the lobes rotately spreading; some cauline leaves ternately divided or parted5. TONELLA.

Perennials.

Corolla short, inflated, with 4 lobes erect and 1 reflexed; sterile stamen adnate to upper lip6. SCROPHULARIA.

Corolla tubular, from strongly to obscurely bilabiate; sterile filament conspicuous, about equaling the fertile ones7. PENTSTEMON.

Stamens 4, all with anthers (except no. 10); fifth stamen wholly absent.

Calyx 5-toothed.

Corolla tubular or funnelform, often elongated.

Calyx 5-angled, plicate-carinate or prismatic.

Shrubs

Herbs9. MIMULUS.

Calyx not prismatic, slightly 5-sulcate; stamens 4, 2 fertile; annual.....

10. MIMETANTHE.

Corolla open-campanulate; stems creeping, bearing tufts of leaves and flower-scapes; diminutive annual.....11. LIMOSILLA.

Calyx of 5 almost distinct sepals; stems creeping; perennial.....12. MONNIERA.

Stamens with anthers 2; sterile pair present or none; corolla little or not at all bilabiate.

Calyx of 5 almost distinct sepals; corolla tubular.

Corolla-lips nearly equal; sterile filaments short or none.....13. GRATIOLA.

Lower lip of corolla larger than upper; sterile filaments forked...14. ILYSIANTHUS.

Calyx 4-parted; corolla 4-lobed.

Stamens 4, 2 sterile; corolla broadly campanulate; leaves in a radical tuft.....

15. SYNTHYRIS.

Stamens 2; corolla subrotate; leaves mainly cauline.....16. VERONICA.

C. Leaves alternate; stamens 4 (2 in some Cordylanthi), all anther-bearing.

Corolla tubular, strongly bilabiate, upper lip narrow, concave or galeate and enclosing the stamens and style.

Calyx tubular, laterally compressed, cleft before and behind, the lobes entire or 2-cleft; upper lip of corolla long and narrow, very much longer than the very small 3-toothed lower lip; bracts mainly with colored tips; ours perennials except one....

17. CASTILLEJA.

Calyx tubular-campanulate, 4-cleft; upper lip (galea) of corolla similar to no. 17, but not so greatly or not at all exceeding the inflated 3-saccate lower one; bracts with or without colored tips; ours annuals.....18. ORTHOCARPUS.

Calyx spathe-like, of 2 distinct leaf-like divisions (or the upper division wanting); corolla-lips of nearly equal length; bracts never colored, annuals.....

19. CORDYLANTHUS.

Calyx narrowly campanulate, 2 to 5-toothed, the orifice often oblique; corolla with narrow tube, strongly bilabiate; upper lip (galea) long, arched; lower lip of 3 small lobes; bracts purple or with foliaceous (green) tips; perennials.....
20. PEDICULARIS.

1. VERBASCUM L. MULLEIN.

Usually biennial herbs with tall virgate stems and alternate leaves. Flowers ephemeral, in spikes or racemes. Calyx 5-parted. Corolla rotate, with 5 nearly equal segments, ours commonly yellow. Stamens 5, all with anthers; all of the three posterior filaments woolly-bearded. Stigma undivided or bilamellate. Capsule septicidally 2-valved, the valves cleft at apex and the septa parting from the persistent axis, releasing many pitted or roughened seeds. (Corrupted from *Barbascum*, the old Latin name.)

Plants very woolly; flowers sessile.....1. *V. thapsus*.
Plants with green herbage; flowers pediceled.....2. *V. blattaria*.

1. **V. thapsus** L. COMMON MULLEIN. Stout, densely woolly, 3 to 6 ft. high; radical leaves 6 to 12 in. long, obovate-lanceolate or -oblong; cauline leaves oblong, entire or crenate, crowded, the stem winged by their very decurrent bases; flowers in a very long dense simple spike; spike 1 ft. long or more, and $1\frac{1}{4}$ in. thick, sometimes with one to several short spikes at base; lower filaments mostly naked.

Stream beds of interior water courses, or waste places about old dwellings: North Coast Ranges; very common in the Sierra Nevada. Naturalized from Europe. June-Aug.

2. **V. blattaria** L. MOTH MULLEIN. Slender, 2 to 4 ft. high; herbage green and glabrous, or the inflorescence glandular-pubescent; leaves not decurrent, 4 in. long or less; upper leaves ovate or ovate-lanceolate, dentate, cordate-clasping; lower leaves oblong, more coarsely toothed or pinnatifid, the basal ones narrowed to a short winged petiole; flowers yellow or white, 1 in. broad, in a long loose simple raceme; pedicels longer than the calyx; filaments all bearded with violet woolly hairs.

Introduced from the Old World: St. Helena; Redwood Peak (Zoe, iv, 156); lower San Joaquin; Lake Co.; and Sierra Nevada foothills.

2. ANTIRRHINUM L. SNAPDRAGON.

Annual or perennial herbs with the lower leaves opposite and the upper leaves alternate. Corolla gibbous or saccate at base on lower side; palate closing the throat. Capsule dehiscing by pores at the base of the style; style (in our species) persistent and often deflexed. (Greek *anti*, like, and *rhinon*, nose, because of the snout-like flowers.)

Perennials; no tendril-like branches.

Leaves linear; sepals $\frac{1}{2}$ the length of the corolla.....1. *A. virga*.
Leaves lanceolate; sepals equaling or shorter than the corolla.....2. *A. glandulosum*.
Annuals; branches or peduncles disposed to be prehensile.

Peduncles about 1 line long; branchlets slender or filiform, at length twisting.....
3. *A. vagans*.
Peduncles 2 to 3 in. long, filiform, prehensile.....4. *A. strictum*.

1. **A. virga** Gray. Erect with many virgate stems from a perennial base, $2\frac{1}{2}$ to 5 ft. high, glabrous; leaves linear, 2 to $3\frac{1}{2}$ in. long, sessile; flowers red-purple in a mostly secund raceme, with subulate bracts; sepals ovate, acute, moderately unequal, scarcely half the length of the corolla; corolla 6 to 7 lines long, the sac at base mammariform; lower pair of filaments dilated at apex, all geniculate at the very base and all hairy, especially at the geniculation

or knee; capsule dehiscing by pores at the base of the style; seeds with the longitudinal wing-like ridges fimbriate.

High remote ridges of the Coast Ranges: Santa Lucia Mts., *Jepson*; Cazadero, *Carruth*; Howell Mt.; Mt. St. Helena; Lake and Mendocino cos. Individuals rare, growing in chaparral or chamise; the known stations few. June.

2. *A. glandulosum* Lindl. Stem stout, branching, 3 to 5 ft. high, very leafy; herbage glandular-pubescent; leaves lanceolate, sessile, gradually diminishing into the bracts of the inflorescence; bracts equaling or shorter than the oblong tube of the corolla; sepals oblong-lanceolate, unequal; "filaments all moderately dilated upwards."

Mt. Hamilton (acc. to Greene); Santa Cruz, and southward.

3. *A. vagans* Gray. At first simple and erect, at length branching and very diffuse, the branches $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long; branchlets slender or filiform, more or less twisting and disposed to be prehensile; leaves ovate, mostly 3 to 5 lines long, or oblong to lanceolate and mostly $\frac{1}{4}$ to 1 in. long, petioled, the uppermost (especially those of the prehensile branchlets) reduced and 1 line long or less; calyx-segments very unequal, linear, except the large uppermost one; this oblong or elliptic-oblong, nearly equaling the tube of the light purple corolla; corolla 5 to 6 lines long; filaments dilated at apex; style slender, as long as the capsule; seeds muriculate-roughened.

Dry open wooded hills or in cañons of the Coast Ranges from Mt. Hamilton northward to the Oakland Hills, Sonoma Co. and Vaca Mts. Common on the higher hills and often abundant. July-Sept. Var. *BREWERI* Jepson. Slender and less diffuse, with smaller corolla (3 lines long) considerably exceeding the less unequal sepals.—Napa Valley to Clear Lake and northward (*A. breweri* Gray). Var. *BOLANDERI* Gray. Rather widely spreading, the branches 14 to 20 in. long, sparsely hispid with gland-tipped hairs; leaf-blade $1\frac{1}{2}$ in. long or less, ovate (those of the filiform branchlets orbicular), the lower on petioles 8 lines long, the upper on petioles about $1\frac{1}{2}$ lines long; upper sepal very large, elliptic-oblong, nearly as long or distinctly shorter than the tube of the $\frac{1}{2}$ in. long corolla.—Redwood region, Marin Co.

4. *A. strictum* (H. & A.) Gray. Erect nearly simple glabrous annual, 1 to 2 ft. high, often climbing by tortile filiform peduncles; lowest leaves ovate-lanceolate, the upper becoming linear or the floral ones filiform and much shorter than the peduncles; calyx-segments linear-lanceolate, little unequal; corolla violet-purple, 5 lines long, the hairy prominent palate nearly closing the throat; fruiting calyx about equaling the crustaceous capsule, this tipped with a straight (not deflexed) style of equal length.

South Coast Ranges: Santa Inez Mts. northward to Arroyo Grande, Los Gatos (Muhl., iii, 118), and Mt. Tamalpais. Rare in our region. Apr.-May.

3. LINARIA Juss.

Annual or perennial herbs. Lower leaves opposite and the upper alternate, entire in ours. Flowers in bracteate racemes, or solitary and axillary. Calyx 5-parted. Corolla bilabiate, more or less tubular, personate and with a spur at base on the lower side; upper lip erect, middle lobe of lower smallest. Stamens 4. Capsule dehiscing below the summit by 1 or 2 simple or lacerate perforations or chinks, many-seeded. (Name derived from *Linum*, Flax.)

Annual or biennial; flowers blue.....1. *L. canadensis*.
Perennial; flowers yellow.....2. *L. vulgaris*.

1. *L. canadensis* DUM. TOAD FLAX. Annual or biennial; flowering stems

one or several, erect, 6 to 18 in. high, with linear mostly alternate leaves, those of the procumbent radical shoots broader and oftener opposite or whorled; flowers in a raceme; pedicels erect, not longer than the slender curved spur of the blue corolla.

Sandy soil, rather uncommon: Palo Alto; San Francisco; Alameda; Oakland; Mt. Tamalpais; Lake Co.; College City, Colusa Co.; French Camp. Mar.-Apr.

2. *L. vulgaris* Mill. BUTTER-AND-EGGS. Perennial, erect, 1 to 2½ ft. high; leaves linear, very numerous; flowers yellow in a terminal dense raceme; corolla (including the slender spur) 1 in. long or more.

Introduced in a few places: Berkeley; Pt. Reyes; Valley Ford.

4. *COLLINSIA* Nutt.

Annuals with opposite leaves. Flowers whorled, forming a raceme, or axillary and scattered. Calyx campanulate, 5-cleft. Corolla declined (the proper tube very short and the abruptly expanded or gibbous throat forming an angle with it), deeply bilabiate; upper lip 2-cleft, with erect lobes; lower lip larger, 3-lobed, the middle lobe conduplicate or keel-shaped and enclosing the 4 declined stamens and style. Filaments long and filiform, the lower pair inserted higher on the corolla than the others; the gland at base of corolla represents the fifth stamen. Capsule septicidal, the valves soon 2-cleft. (Zaccheus Collins, American botanist, of Philadelphia, 1764-1831. Species variable. The corolla is a striking imitation of the papilionaceous type.)

Filaments with the upper pair bearded, the lower pair glabrous.

Flowers long-pedicel (some or all the pedicels much longer than the flowers), solitary, or the upper in whorls of two or three.....1. *C. sparsiflora*.

Flowers short-pedicel or almost sessile, crowded in whorl-like clusters, the lowest subtended by leaves, the others by bracts.

Herbage staining brown; upper lip of corolla commonly destitute of crests or transverse ridge; flowers yellowish or whitish, usually with purple markings.....

2. *C. tinctoria*.

Herbage not staining; upper lip of corolla with a low transverse ridge at its junction with the throat.

Corolla rose-purple or violet, the upper lip paler or whitish; calyx-lobes commonly lanceolate, acute.....3. *C. bicolor*.

Corolla white or nearly white, the lower lip lilac or purple tinged; calyx-lobes oblong, obtuse.....4. *C. bartsiaefolia*.

Filaments all glabrous; upper lip of corolla with a jagged wing-like crest at base of lobes or with a pair of prominent callous teeth on each side; flowers in whorls of 2 to 4, the pedicels sometimes as long as the calyx.....5. *C. greenii*.

1. *C. sparsiflora* F. & M. Slender, branched from near the base, commonly about 6 in. high; herbage reddish; lowest leaves elliptical, 3 lines long, with 1 or 2 teeth on each side, on petioles nearly as long, the upper oblong to linear, twice as long or more and becoming gradually sessile; corolla 4 to 6 lines long; upper lip bluish or sometimes yellowish at base, purple-dotted at throat, hardly shorter than the lower lip; lateral lobes of lower lip purple; upper lip with an evident transverse ridge or crest; keel sometimes yellowish externally, more or less pilose-pubescent; upper pair of filaments pubescent on the upper side; gland conical or somewhat elongated; seeds concave on one side and convex on the other, acutely margined, about 2 in each cell.

Common in low fields or in wet places on hillsides. Coast Ranges, Sierra Nevada foothills and Southern California. Healdsburg; Napa Co.; Lake Co.; Oakland Hills; San Francisco; Santa Cruz Mts.; Martinez; Chico. Apr.-May.

2. *C. tinctoria* Hartweg. Stems stoutish, simple or diffusely branching,

1 to 2 ft. long; herbage glandular-viscid above, at least on the branches, and imparting a brownish stain; lower leaves oblong to lanceolate, with short petioles, the upper ovate or triangular-lanceolate, sessile by a broad or subcordate base, serrate or entire; corolla white to yellowish, bent below the horizontal a trifle; upper lip very short, with 2 transverse purple lines; lower lip with longitudinal pencilings or lines; throat very strongly saccate-ventricose, forming a right angle with the tube; seeds small, smoothish.

Wooded hillsides, mostly rare in the Coast Ranges: Mt. Diablo (Erythraea, i, 177); Kenwood; Howell Mt.; Calistoga; Mark West Creek; Noble's, between Skaggs and Stewarts Pt., *W. C. Morgan*. Common in the Sierra Nevada foothills. June. Gives an iodine-like stain to the hands.

3. *C. bicolor* Benth. CHINESE HOUSES. Simple or branching from the middle, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, glabrous or finely pubescent and often viscid above; leaves broadly oblong, or the upper narrowed from the broad base to the apex, serrulate, 2 in. long or less; pedicels shorter than the oblong-acute or lanceolate calyx-lobes; corolla rather less than 1 in. long, with lower lip violet or rose-purple, the upper lilac or white, a little shorter than the lower, the lobes recurved-spreading and with low but distinct crests at the point of junction with the tube; saccate throat very oblique to the tube, bristly within, usually with 3 longitudinal purple lines beneath each lobe of the upper lip; whole corolla sometimes varying to white; gland conical; seeds reticulate-rugose, about 6 in each cell.

Very common in the edges of woods: Coast Ranges; Sierra Nevada; Southern California. Apr.-June.

4. *C. bartsiaefolia* Benth. Nine in. high or less, finely puberulent and often glandular; leaves thickish or even fleshy, ovate or ovate-oblong to linear, about 1 in. long; flower-clusters 2 to 5; calyx usually white-villous, its lobes broad and obtuse; corolla whitish, the lower lip tinged with lilac or purple, less declined than in no. 3, the upper lip with few purple lines or dots above, about the length of the curved gibbous throat, with a transverse callous crest or ridge at its origin; lateral lobes of the lower lip often emarginate or obovate; upper portion of throat of corolla pubescent inside; upper pair of filaments bearded on the upper side to the middle or above; anthers with divergent lobes; gland sessile and elongated; seeds 2 in each cell (Gray) or as many as 15 to 20 (Hall).

Sands near the seashore: Ft. Bragg; San Francisco and southward to Southern California. Also at Antioch. Apr.-June.

5. *C. greenei* Gray. Slender, diffusely branched, 6 to 8 in. high, glandular-puberulent; leaves linear, or tapering to apex, entire or obscurely dentate; pedicels sometimes as long as the calyx; corolla deep azure-blue; upper lip much shorter than the oblong throat, about half the length of the lower, and very prominently wing-crested or toothed at its origin; lateral lobes of lower lip small; gland small; filaments glabrous.

Rocky places in the North Coast Range mountains: Geysers, Sonoma Co.; Black Butte, Mendocino Co.; Blue Lakes grade. June.

5. TONELLA Nutt.

Slender branching annuals. Leaves opposite, entire, dentate or ternately divided. Flowers small, almost like those of *Collinsia*. Corolla scarcely declined, only slightly bilabiate, the lobes subrotately spreading and not obviously dissimilar. Fifth stamen represented by a small gland. Seeds 1 to 4 in each cell. (Origin of name unknown.)

1. **T. tenella** (Benth.) Heller. Branches almost filiform, 6 in. high; leaves heteromorphic, the lowest rotund to ovate, entire or with deep notch on each side near the apex, 2 to 4 lines long, on petioles longer than the blade, the upper palmately 3-parted or -divided into oblong segments, the middle segment longest; bracts entire, shorter than the pedicels; pedicels in 2s or 3s, as much as 1 in. long; corolla minute, little exceeding the calyx, white or very pale blue, the lobes of some of them purple-dotted; capsule exceeding the calyx; seeds 1 to each cell.—(*T. collinsioides* Nutt. *Collinsia tenella* Benth.)

Seemingly uncommon within our limits, but easily overlooked: Mt. Hamilton (*Erythraea*, i, 94); Los Gatos; Sonoma; Humboldt Co. and northward to Oregon.

6. SCROPHULARIA L. FIGWORT.

Rank perennial herbs with opposite leaves. Flowers small, dull reddish, cymose, the cymes disposed in a narrow terminal panicle. Calyx 5-parted into broad rounded lobes. Corolla with a somewhat globular tube, the two upper lobes longer than the two lateral, all erect except the short deflexed lower one. Stamens with anthers 4, the fifth sterile and adnate to the tube of the corolla, appearing like a scale under the upper lip. Capsule septicidal, many-seeded. (Latin *scrofulae*, the plant a one-time remedy for scrofula.)

1. **S. californica** Cham. Tall, 3 to 6 ft. high, glabrous except the finely glandular-pubescent inflorescence; leaves ovate, cordate at base, serrate or incised-serrate; corolla about 4 lines long, with a nectar-disk at base of flower.

Common in moist places, mostly along gulches in the hills: Coast Ranges; Sierra Nevada; Southern California. May-June. Var. *FLORIBUNDA* Greene has the panicle with very flexuous branches and grows along rock outcroppings: Pellejo Hills (Solano Co.) and elsewhere.

7. PENTSTEMON Mitch.

Perennial herbs or suffrutescent plants of hilly districts. Leaves opposite, the upper sessile. Flowers mostly showy, in racemes, panicles, or cymes. Calyx 5-parted. Corolla tubular and often inflated, the limb either slightly or strongly bilabiate; upper lip 2-lobed, the lower 3-cleft. Stamens with anthers 4, declined at base, ascending above; fifth stamen represented by a conspicuous sterile filament which is often dilated or bearded. Capsule septicidal (the valves cleft at apex through the persistent base of the style), many-seeded. Seeds angled. (Greek *pente*, five, and *stemon*, stamen.)

Anthers densely woolly; corolla red.....1. *P. newberryi*.
Anthers glabrous.

Sterile filament bearded.

Corolla scarlet, 1 in. long; sterile filament bearded its whole length.....2. *P. corymbosus*.

Corolla purplish and yellowish, $\frac{1}{2}$ in. long; sterile filament bearded at apex only....
3. *P. lemmonii*.

Sterile filament naked.

Corolla bright vermilion, tubular-cylindric.....4. *P. centranthifolius*.

Corolla blue or purple, tubular at base, ventricose-funnelform above.....
5. *P. heterophyllus*.

1. **P. newberryi** Gray var. **sonomensis** Jepson. Stems 8 to 12 in. high from a woody base; leaves coriaceous, orbicular to round-ovate, about 7 lines long, serrulate, rarely inclined to be entire; racemes sessile; sepals narrowly lanceolate; corolla bright red, 1 to $1\frac{1}{4}$ in. long, with nearly equal and not

widely spreading segments; lower lip with two densely bearded folds; anthers slightly exserted, densely woolly; sterile filament bearded at apex.

Among rocks of the North Coast Ranges: Hood's Peak; Mt. St. Helena. May. The species is found in the high Sierra Nevada.

2. *P. corymbosus* Benth. Stems 12 to 16 in. high, arising from depressed shrubby evergreen mats, glabrous except the glandular-pubescent inflorescence; leaves oblong, acute at both ends, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, denticulate or entire, short-petioled; flowers in terminal corymbs; sepals linear or somewhat narrowed above; corolla tubular, 1 in. long, scarlet, bilabiate; lower lip abruptly spreading, 3-parted into oblong lobes; upper erect, 2-cleft; filaments all pubescent at the very base, the sterile one bearded its whole length on one side.

Rocky ledges and cliffs of the higher Coast Ranges: Mt. Hamilton; Mt. Diablo; Santa Cruz; and northward to Elk Mt. (Lake Co.) and Mt. Shasta. July-Aug.

3. *P. lemmonii* Gray. BUSH BEARD-TONGUE. Of erect bushy habit, 2 to 4 ft. high, with vigorous herbaceous glaucous stems from a woody base, rather remotely leaved; leaves light green, ovate or ovate-lanceolate, acute, $1\frac{1}{2}$ in. long or less, sparsely serrulate; sepals narrowly ovate, acuminate; corolla purplish and dull yellow, small ($\frac{1}{2}$ in. long), with short tube, campanulate dilated throat and spreading lips; sterile filament strongly bearded on one side of the curved apex; capsule 2 lines long.

North Coast Range cañons along streams: Vaca Mts. northerly to Siskiyou Co. and northwestward. Also in the Sierra Nevada: Bear Valley (Placer Co.) and northward. Aug.-Sept.

4. *P. centranthifolius* Benth. SCARLET BUGLER. Herbaceous, glaucous, 1 to 3 ft. high; leaves ovate to oblong-lanceolate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, with subcordate clasping base; pedicels slender, $\frac{1}{2}$ in. long or less; sepals round-ovate; corolla about 1 in. long, bright vermilion, tubular, hardly bilabiate, the segments nearly equal, except that the two upper are united higher; sterile filament naked; capsule 6 or 7 lines long, including the persistent portion of the style.

Coast Range cliffs: Vaca Mts. to Monterey and southward to Southern California; also on the Antioch sandhills. Apr.

5. *P. heterophyllus* Lindl. Minutely puberulent; of bushy or tufted habit, the stems erect or ascending, many from the base, 1 to $1\frac{1}{2}$ ft. high; leaves linear to lanceolate or broader, $1\frac{1}{2}$ in. long or less; sepals ovate, acuminate; corolla rather abruptly ventricose-dilated above the narrowly tubular base, 1 to $1\frac{1}{4}$ in. long, blue or purple; upper lip short, more or less reflexed, lower longer, spreading; sterile filament naked.

Open places in the Coast Range hills, or even in stream beds, rather common. May-June. Mostly with reddish stems. Also distinguishable by its sagittate or horseshoe-shaped and ciliate anthers which dehisce from the apex only to the middle (subgenus *Saccanthera*), the preceding species with divaricate or divergent anther cells, which dehisce their whole length or nearly (subgenus *Eupentstemon*).

8. DIPLACUS Nutt.

Evergreen glutinous shrubs with branching pubescence and opposite leaves which are revolute in the bud. Flowers red, orange or salmon-colored, solitary in the axils. Calyx tubular, 5-angled, 5-toothed. Corolla with funnel-form tube and rather broad bilabiate limb. Stamens 4. Stigmas 2, closing to-

gether when irritated. Capsule firm-coriaceous, linear-oblong, included in the calyx, with a woody enlargement at the pointed apex, opening down the upper suture only or mainly, the valves spreading out nearly flat and bearing the placentae on their middle. (Greek *di*, double, and *plakous*, a cake, referring to the placentae.)

1. *D. glutinosus* Nutt. BUSH MONKEY-FLOWER. Low shrub, 2 to 4 ft. high; leaves oblong-lanceolate, revolute, denticulate, glabrous and deep green above, pubescent beneath with branching hairs; corolla buff or salmon-color, $1\frac{1}{2}$ in. long or more, the throat narrow-funnelform, the lobes emarginate, with more or less irregular margin.

Common on cañon sides everywhere in the Coast Ranges, especially on dry rocky hillsides. May-Sept. Fairly well marked varieties occur in the Sierra Nevada and Southern California.

9. MIMULUS L. MONKEY-FLOWER.

Herbs with opposite leaves. Flowers mostly showy, yellow, red or white, solitary and axillary, or in terminal racemes. Calyx prismatic, 5-angled, 5-toothed. Corolla from tubular to funnelform, with strongly bilabiate limb or with merely slight inequality of lobes, a pair of bearded or naked ridges running down the lower side of the throat. Stamens 4. Stigma mostly of 2 flat lobes closing together when irritated. Capsule dehiscent by both sutures, dehiscent on one side only, or cartilaginous and indehiscent. Seeds many. (Diminutive of the Latin *mimus*, a comic actor, on account of the gaping or grinning corolla.)

A. Flowers red, crimson, or scarlet.

1. *Acaulescent* or *short-caulescent* dwarf annuals, glabrous or nearly so; corolla very large for the size of the plant, with long and often filiform tube; capsule cartilaginous, indehiscent.

Corolla-limb broad; upper lip exceeding the lower; tube filiform, 4 to 6 times the length of the funnelform throat1. *M. angustatus*.
Lower lip of the corolla almost none; upper lip conspicuous, erect; throat narrowly campanulate or urn-shaped2. *M. subuniiflorus*.

Corolla-limb not very irregular; throat open-funnelform, about half the length of the tube; branches (when manifestly caulescent) decumbent3. *M. tricolor*.

2. *Caulescent* (as all the following) and erect, usually viscid-puberulent; corolla large or small; capsule dehiscent.

Pedicels 1 or 2 lines long or less; corolla red; capsule dehiscent down the upper suture and a little past the apex (rarely to the base) on the lower suture; herbage more or less glandular- or viscid-pubescent.

Corolla-lips strongly unequal.

Calyx narrowly cylindrical, scarcely plicate, orifice very oblique; lower lip of corolla $\frac{1}{2}$ as long as upper.....4. *M. kelloggii*.

Similar but smaller; corolla limb $1\frac{1}{2}$ to 2 lines in diameter.....5. *M. congdonii*.

Corolla-lips little unequal.

Corolla-tube exerted from calyx.

Calyx strongly plicate, the orifice very oblique and the broad teeth unequal.....

6. *M. bolanderi*.

Calyx scarcely plicate, the teeth subequal, acute and slender.....7. *M. layneae*.

Corolla-tube not exerted from calyx; calyx similar to no. 7.....8. *M. rattanii*.

Pedicels 1 to $2\frac{1}{4}$ in. long; capsule dehiscent by both sutures (as in all the following).

Corolla bright scarlet, strongly bilabiate, $1\frac{1}{4}$ to 2 in. long; robust perennial.....9. *M. cardinalis*.

Corolla crimson, scarcely bilabiate; slender annual.....10. *M. androsaceus*.

B. Flowers yellow or white.

Glabrous or somewhat pubescent, at least not viscid-slimy; stems erect; flowers yellow or white.

Corolla small, subregular and

Straw-yellow; dwarf annual11. *M. rubellus*.

Nearly white or slightly yellowish; annual.....12. *M. latidens*.

Corolla large, golden yellow, purple-dotted or splotted, strongly bilabiate; annual or perennial: vars. of13. *M. longsdorffii*. Slimy viscid-pubescent herbs, with mostly weak and decumbent stems and light yellow subregular corollas.

Corolla $\frac{1}{2}$ in. or less long; calyx-teeth short, $\frac{1}{2}$ line long; leaves petioled; annual.... 14. *M. floribundus*.

Corolla about 1 in. long; calyx-teeth $\frac{1}{2}$ length of the tube; leaves mostly sessile; perennial15. *M. moschatus*.

1. *M. angustatus* Gray. Acaulescent, glabrous; leaves linear, $\frac{1}{4}$ to 1 in. long; calyx 2 to 3 lines long, the teeth very little unequal; corolla crimson, purple- and yellow-dotted, with filiform tube 1 to $1\frac{1}{2}$ in. long, 4 to 6 times the length of the short funnelform throat; limb broad, upper lip exceeding the lower; capsule short-ovate, not flattened, almost as long as thick; seeds favose-pitted.

Borders of surface streams in the mountains north of San Francisco Bay (Mt. George, Howell Mt.); also in the Sierra Nevada. Apr.-May 15.

2. *M. subuniflorus* Greene. Acaulescent or nearly so, about $1\frac{1}{2}$ in. high; leaves rhombic-ovate to oblong, 2 to 4 lines long, entire or crenate-toothed; corolla crimson or red-purple, $1\frac{1}{2}$ in. long, the slender tube twice or thrice the length of the calyx; the throat oblong-urn-shaped or campanulate; upper lip conspicuous, erect; lower lip reduced to a narrow 2 or 3-crenate border or consisting of a more prominent tooth-like middle lobe and the lateral lobes obsolete; capsule $\frac{1}{2}$ in. long, very gibbous.—(*M. douglasii* Gray.)

Wet hillsides: Coast Ranges and Sierra Nevada.

3. *M. tricolor* Hartw. Short-caulescent and erect or the branches 3 to 4 in. long and decumbent; leaves lanceolate to oblanceolate-oblong, $\frac{3}{4}$ to 1 in. long, entire or remotely toothed; corolla rose-purple, $1\frac{1}{2}$ to 2 in. long, with little unequal lips and broadly funnelform throat bearing markings of crimson and yellow; capsule slightly gibbous, compressed.

Edges of vernal pools, plains of the Sacramento and San Joaquin valleys. Apr. 15-May.

4. *M. kelloggii* Curran. Erect, simple, 2 to 5 in. high, or occasionally 7 or 8 in. with several branches from the base, viscid-pubescent; leaves broadly ovate to oblong (the lowest elliptic-ovate), mostly attenuate at base to a petiole, $\frac{1}{2}$ to 1 in. long, generally dull purple beneath; calyx narrowly cylindrical (6 lines long and 1 line broad), very oblique, the teeth very short and obtuse; corolla-tube very long and slender, twice as long as the calyx, expanding into the short funnelform throat and broad limb, the lower lip only $\frac{1}{2}$ as long as the upper and more spreading; capsule 4 to 5 lines long, slender, bisulcate, slightly curved outwardly (with the calyx), or sometimes contorted, simulating that of *Oenothera micrantha*.

Mountain slopes: North Coast Ranges; Sierra Nevada (El Dorado Co.). Apr.

5. *M. condonii* Robinson. Very similar to the preceding, but usually smaller; corolla rose-purple, about 8 lines long, throat narrow, limb only $1\frac{1}{2}$ to 2 lines in diameter; capsule 2 to 3 lines long, acute, compressed.

Sierra Nevada; Mt. Tamalpais; rare in our limits.

6. *M. bolanderi* Gray. TOBACCO MIMULUS. Simple or much branched with erect branches, 5 to 16 in. high, glandular-pubescent and very viscid; leaves lanceolate or oblong, sometimes obovate, sometimes sparingly denticulate at apex, 1 to $1\frac{3}{4}$ in. long, sessile; calyx 2 to 3 lines broad, 5 to 6 lines long, strongly plicate-angled, somewhat contracted at the very oblique orifice, its teeth acute, the upper much the longest; corolla dark red, 6 to 9 lines

long, the tube not slender, moderately exserted; limb about 4 lines broad, the lips of nearly equal length; capsule not exceeding the calyx-teeth, slender, and narrowed to the pointed apex, about 5 lines long, 1 line broad.

Santa Lucia Mts., Mt. Hood Range, Lake Co. and northward in the Coast Ranges; Sierra Nevada. Aug. With the odor of Nicotiana, and in some localities called "Wild Tobacco."

7. *M. layneae* Greene. Much branched with mostly spreading branches, 4 to 7 in. high, viscid-pubescent and somewhat nigrescent; leaves narrowly ovate to oblong, acute at base and apex, about 6 or 7 lines long; calyx 4 lines long, its teeth sharply acute, slender, exceeding $\frac{1}{2}$ line; corolla red, tubular-funnelform, over $\frac{1}{2}$ in. long, much exserted; capsule acute, exserted.

Napa Range, Mayacamas Range and north to Mt. Shasta. Rarely collected.

8. *M. rattanii* Gray. Erect, branched from the base, 4 to 5 in. high; herbage glandular-viscid with a nigrescent indument; leaves obovate, oblong or oblanceolate, mostly tapering above and below, 6 lines long or less; flowers solitary in the axils and condensed at the ends of the branches in somewhat capitate clusters of 2, 3, or 4; corolla-tube scarcely exserted from the narrowly campanulate or in age somewhat urn-shaped calyx; calyx-teeth little unequal; apex of capsule narrow, somewhat curved, exserted.

Colusa Co., *Rattan*; Bartlett Mt., Lake Co.; Mt. Tamalpais. The calyx is rather broad, as in *M. bolanderi*, not narrow as in *M. kelloggii*.

9. *M. cardinalis* Dougl. Perennial, 1 to 3 ft. high, branched from the base with ascending branches; herbage villous-puberulent, especially on the stems; leaves elliptic-ovate, 2 in. long or more, dentate, scarcely sessile; pedicels in the upper axils, longer than the flowers, commonly longer than the leaves, $\frac{3}{4}$ to $2\frac{1}{4}$ in. long; calyx strongly prismatic, with equal triangular teeth; corolla bright scarlet, $1\frac{1}{4}$ to 2 in. long, the throat yellowish with crimson lines, the tube little exserted from the calyx; upper lip of corolla erect, deeply 2-lobed, the sides turned back until they meet or overlap; lower lip deeply 3-lobed, the lateral lobes reflexed, the middle lobe spreading; capsule chartaceous.

Stream beds, rivulets, or springs of the Coast Ranges and Sierra Nevada. June-Oct. The strongly prismatic angles of the calyx follow out into the teeth in such wise that the teeth are conduplicate; each lobe of the corolla is rather strongly emarginate; anthers mostly densely hispid-ciliate; filaments dilated at insertion.

10. *M. androsaceus* Curran. Slender erect branching plant, $1\frac{1}{2}$ to 6 in. high; herbage slightly viscid-glandular; leaves obovate-oblong, 3 to 6 lines long; pedicels nearly 1 to $1\frac{1}{2}$ in. long; calyx 3 lines long, in flower cylindric, broadening in age; teeth short, equal, triangular; corolla crimson, little bilabiate, 6 lines long or rather less.

Tehachapi and southward. Known in our district only on Ben Lomond (Santa Cruz Co.).

11. *M. rubellus* Gray. Dwarf annual 1 to $1\frac{1}{2}$ in. high; stem filiform, solitary from the rosulate tuft of radical leaves, or with one or two smaller stems, all naked below the somewhat corymbose inflorescence of two or three flowers; leaves ovate, 2 to $2\frac{1}{2}$ lines long; calyx 2 lines long, half as long as the funnelform corolla; corolla yellow, only slightly irregular.

Howell Mt.; not uncommon in the Sierra Nevada but usually much larger. May-July.

12. *M. latidens* Greene. Annual, glabrous, slender, erect and simple, or commonly with several ascending branches from the base, the internodes below the inflorescence very long; leaves sessile, ovate to ovate-lanceolate, remotely denticulate or entire, $\frac{1}{2}$ to 1 in. long; pedicels surpassing, often much surpassing the leaves, or the uppermost leaves reduced to bracts and the inflorescence subracemose; flowering calyx cylindric, 3 lines long or less; fruiting calyx ovate-campanulate; corolla nearly white or slightly yellowish, little exserted, the narrow limb almost regular; capsule oblong.—(*M. inconspicuus* Gray var. *latidens* Gray.)

Low wet fields: Sacramento Valley; Napa Valley; Antioch. Apr.-May. Basal leaves often subrosulate and petiolate. Herbage sometimes slightly viscid-puberulent.

13. *M. langsдорffii* Donn var. *guttatus* Jepson. Annual, or perhaps sometimes perennial by the production of stolon-like stems at base; stems simple or sometimes branching, one to several from the base, about 1 to 2 ft. high; herbage glabrous or slightly pubescent; leaves more or less elliptical, thinnish, irregularly serrate or dentate, the lower petioled, the upper sessile; petioles mostly shorter than the blades; flowers in a terminal raceme; pedicels shorter than or equaling the flower; calyx in anthesis 3 to 5 lines long, in fruit often nodding, somewhat longer and nearly or quite twice as broad; calyx-teeth often disposed to be approximate or connivent in age, the upper the longer; corolla yellow, with purple or brown dots in throat, $\frac{3}{4}$ to 1 in. long.—(*M. guttatus* DC. *M. luteus* of Bot. Cal., etc.)

Sierra Nevada and high North Coast Ranges. June-Aug. A highly variable but exceedingly interesting species which in the Bay region has developed an attractive array of varieties, some of which are here described as follows: Var. *INSIGNIS* Greene; annual (as all the following), 6 to 20 in. high; foliage very scanty; lowest petioles long; corollas 1 to $1\frac{1}{2}$ in. long, with a large purple splotch and several small purple dots on the lower lip.—Napa and Sonoma valleys. Apr. One of the most showy plants of the genus. Var. *ARVENSIS* Jepson; size of the preceding or larger; lower leaves often with several pairs of small leaflets near the main blade; floral leaves sometimes soft-villous; orifice of the mature calyx broad-campanulate, commonly truncate.—Wet fields: Howell Mountain and elsewhere. Var. *CALIFORNICUS* Jepson; annual, simple or branching, stoutish, $\frac{1}{3}$ to 2 ft. high; leaves round or roundish, often broader than long (as in all the following varieties, especially the sessile upper ones), dentate or sharply serrate, often with narrow salient lobes at base; flowers 1 to $1\frac{1}{2}$ in. long.—Common in the Sacramento and Coast Range valleys. Apr.-May. Var. *GRANDIS* Greene; similar to the preceding but said to be perennial; stems fistulose, 2 to 3 ft. high; leaves ample (as much as $3\frac{1}{2}$ in. long), on short petioles; flowers $1\frac{1}{4}$ to 2 in. long.—Rank form found along ditches and slow streamlets in the Bay region. May-Sept. Var. *NASUTUS* Jepson; stems $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high; teeth of the calyx in mature fruit often very strongly turned towards the upper one which is thrice the length of the others; corolla large or little surpassing the calyx.—Mountain rivulets and springs of the North Coast Ranges and doubtless elsewhere. Apr.-May.

14. *M. floribundus* Dougl. Annual; stems slender, at first erect, later diffuse, 5 to 15 in. long; herbage more or less slimy-viscid and musk-scented; leaves ovate, $\frac{1}{2}$ to 1 in. long, dentate, short-petioled; pedicels mainly longer, sometimes shorter than the leaves; calyx narrowly campanulate (in fruit ovate),

2 to 3 lines long, the teeth $\frac{1}{2}$ line long, hardly unequal; corolla light yellow, exceeding the calyx, mostly twice as long; capsule globose-ovate, obtuse.

Springy places and stream shores in the mountains: Sierra Nevada; Coast Ranges (but not reported from the Bay region). May-June. There are dwarf forms 2 to 3 in. high.

15. *M. moschatus* Dougl. var. *sessilifolius* Gray. More or less villous, the whole plant wet as if with slimy dew, strongly musk-scented; stems weak, reclining, sometimes slender with long internodes, rooting at the nodes, 1 to 2 ft. long, from perennial creeping rootstocks; leaves sessile or shortly petioled, ovate, remotely dentate, about 2 in. long; flowers only in the upper axils; pedicels 1 to 2 in. long or more; calyx-teeth lanceolate, 2 to 3 lines long, nearly or quite $\frac{1}{2}$ the length of the tube, moderately unequal; corolla yellow, much exceeding the calyx, 1 in. long; capsule ovate, acute.—(*M. inodorus* Greene.)

Along streams and about springs in the mountains and north and south along the coast: Santa Cruz Mts.; Marin Co.; Howell Mt.; Lake Co.; not reported from the inner Coast Ranges. June-Aug.

10. MIMETANTHE Greene.

Erect branching annual with long villous white hairs. Flowers small, yellow. Calyx short-campanulate, deeply 5-cleft, its tube slightly 5-sulcate, not prismatic-angled or even carinate. Corolla obscurely bilabiate, its lobes plane. Stamens 4, 2 fertile, or all 4 fertile. Capsule pointed, loculicidal, dehiscent the whole length of the upper side and on the lower side along the apical attenuation; placentae tardily separating, borne on the shortly 2-cleft valves. (Greek mimetes, an imitator, and anthos, blossom, on account of the resemblance to *Mimulus*. The resemblance is so close as to weaken the genus greatly.)

1. *M. pilosa* (Benth.) Greene. At length much branched, leafy, flowering from near the base, mostly about 8 to 10 in. high; herbage glandular-viscid and with disagreeable solanaceous odor; leaves lanceolate or narrowly oblong-ovate, entire, sessile; flowers on slender pedicels, the lower pedicels surpassing the leaves; upper tooth of calyx often longer than the others, equaling the tube; corolla bright yellow, its lower lobe usually with brown spots, slightly exceeding the calyx, 3 to 4 lines long; capsule oblong-ovate, attenuate.—(*Mimulus exilis* Durand. *M. pilosus* Wats.)

Moist stream and river beds: Coast Ranges; Sacramento and San Joaquin valleys; Sierra Nevada foothills and southward. July-Sept. Rather common.

11. LIMOSELLA L. MUDWORT.

Diminutive tufted annuals. Stems creeping in the mud (never ascending), bearing at intervals clusters of leaves and scapes. Leaves narrow, entire, fleshy. Scapes naked, 1-flowered. Calyx 5-toothed. Corolla nearly regular, open-campanulate, 5-cleft. Stamens 4, all fertile. Style short. Capsule globose, 2-celled only at base, many-seeded. (Latin *limus*, mud, and *sella*, seat, the species growing in moist localities.)

1. *L. aquatica* L. Tufts 1 to $1\frac{1}{2}$ in. high; leaves exceeding the scapes, narrowly oblong, 3 to 6 lines long, on long petioles (5 to 12 lines); corolla very small (less than 1 line long), white or purplish.

Muddy shores of ponds and lakes: San Mateo Co.; San Francisco; Pt. Reyes. June-July.

12. MONNIERA P. Br.

Perennial herbs with opposite leaves and solitary axillary flowers. Calyx of 5 almost distinct imbricated sepals, the upper broadest. Upper lip of the

campanulate corolla emarginate or 2-lobed, the lower 3-lobed. Stamens 4, all fertile. Capsule thin, 2-valved, the valves 2-parted. Placentae remaining united in the axis, the valves of the capsule separating from them. (L. G. C. Monnier, 1713-1799, Professor of Botany at Paris.)

1. *M. rotundifolia* Michx. Stems succulent, creeping, 10 to 14 in. long, villous-pubescent or almost glabrous; leaves rotund, sessile, flabellately many-nerved from the base, $\frac{1}{2}$ in. long; pedicels 1 or 2 in the axils, longer than the white flowers; corolla little irregular.—(Var. *eisenii* Jepson. *Herpestis eisenii* Greene.)

Aquatic or in muddy situations: San Joaquin Valley (Stockton to Fresno). Perhaps introduced.

13. GRATIOLA L.

Low annual with opposite sessile leaves and axillary 1-flowered peduncles. Calyx of 5 almost distinct nearly equal sepals. Corolla tubular; upper lip entire or bifid, the lower 3-cleft. Anther-bearing stamens 2, posterior; anterior pair consisting of sterile rudiments or wanting. Stigma dilated or with two flat lobes. Capsule 4-valved, the valves separating from the placenta-bearing axis. (Latin *gratia*, grace or esteem, in reference to its medicinal virtues.)

1. *G. ebracteata* Benth. Stems somewhat succulent, ascending, 2 to 3 in. high; herbage obscurely pubescent; leaves lanceolate, entire, $\frac{1}{2}$ in. long or less; peduncles longer than the flowers; sepals lanceolate, 4 lines long or less, equaling the yellow corolla and surpassing the globular and somewhat 4-angled capsule; sterile stamens wanting or represented by minute rudiments.

Wet soil in the north Coast Range valleys: Napa; Sonoma Valley and far northward into Oregon.

14. ILYSANTHES Raf.

Small annuals with opposite sessile leaves. Flowers small, axillary, on filiform naked peduncles (or the upper becoming racemose). Calyx of 5, almost distinct sepals. Corolla tubular; upper lip short, erect, 2-cleft; lower lip larger, spreading, 3-cleft. Fertile stamens 2, posterior, inserted low down; anterior stamens sterile, inserted high in the throat, forked, one of the divisions glandular and obtuse, the other acute and sometimes bearing the rudiment of an anther. Stigma 2-lobed. Capsule many-seeded, septicidal or septifragal. (Greek *ilus*, mud, and *anthos*, flower, the species a denizen of wet places.)

1. *I. gratioides* Benth. Diffusely branching, 3 or 4 in. high, the stems and branches very slender; herbage glabrous; leaves ovate or oblong, 4 to 8 lines long, sparingly denticulate or entire; peduncles long and slender, several times longer than the flowers, solitary in the axils or subracemose above by the reduction of the subtending leaves to bracts; calyx 1 line long; corolla 3 to 4 lines long, bluish.

Muddy shores of the lower San Joaquin. Aug.-Sept.

15. SYNTHYRIS Benth.

Perennial herbs with the rounded petioled leaves in a radical tuft. Flowers racemose. Calyx 4-parted. Corolla with very short tube and 4-lobed rotate-campanulate limb. Stamens 2, inserted close to the upper sinuses, exserted. Anther cells parallel, not confluent. Capsule compressed, loculicidal. (Greek *sun*, together, and *thuris*, a little door, referring to the continued adherence of the base of the valves to the placentae.)

1. *S. rotundifolia* Gray. Plants $2\frac{1}{2}$ to 5 in. high; herbage appressed-scabrulose; leaves ovate-cordate, doubly crenate, 2 in. long, shorter than the

petioles; peduncles scarcely longer than the leaves; inflorescence loosely corymbose-racemose; the bracts small and the pedicels, at least the lower, several times longer than the flowers; corolla white, 2 lines long; capsule scarcely known.

Mt. Tamalpais; Bolinas Ridge; Humboldt Co. and northward to Oregon. Mar.-Apr.

DIGITALIS PURPUREA L. Foxglove. Tall stout biennial topped by long terminal commonly 1-sided racemes of showy flowers; corolla tubular-campanulate, declined, white or purple.—European garden plant naturalized on the Humboldt and Mendocino coasts. In Europe it is poisonous to horses; no reports received from California.

16. *VERONICA* L. SPEEDWELL.

Ours herbs with cauline leaves and flowers in axillary or terminal racemes, or solitary. Pedicels without bractlets. Calyx in ours 4-parted. Corolla sub-rotate, deeply 4-cleft, the upper lobe commonly broader than the lateral lobes or the lower one. Stamens 2, one on each side of the upper corolla-lobe, exserted. Stigma entire. Capsule flattened, often obcordate, septicidal. Seeds few to many. (Name thought to be in memory of St. Veronica.)

Flowers solitary in the axils, the leaves alternate or the lowest opposite; annuals.

Diffuse plants; flowers blue; capsule with two strongly divergent lobes; fruiting pedicels $\frac{3}{4}$ to 1 in. long.....1. *V. buxbaumii*.

Erect plants; flowers white; capsule obcordate, on pedicels $\frac{1}{2}$ to 1 line long.....2. *V. peregrina*.

Flowers in racemes in the axils of the opposite leaves; capsule rotund, not deeply or scarcely at all notched at apex.....3. *V. americana*.

1. *V. buxbaumii* Tenore. Stems branched from the base, $\frac{1}{2}$ to 1 ft. or more long, diffuse or procumbent; herbage pubescent with spreading hairs; leaves roundish or oval, often broader than long, 5 to 7 lines long, on petioles 1 line long, rather deeply toothed above the base; flowers blue with a small white center, $2\frac{1}{2}$ to 3 lines broad; short tube of corolla closed with a barrier of hairs; upper and lateral lobes subequal, larger than the lower lobe; filaments thick-fleshy; capsule 4 lines broad, with two strongly divergent lobes, appearing as if twin; seeds about 9 in each cell, oblong or roundish, wrinkled, with a fissure on one side, 1 line long.

Escaped from gardens: Berkeley; Newark; Woodland. Apr. Another garden annual, *V. ARVENSIS* L., Corn Speedwell, is sometimes met with as an escape; pedicels shorter than the flowers; corolla blue, smaller; capsule notched at apex, the lobes not divergent.

2. *V. peregrina* L. NECKWEED. Annual, erect, 4 to 9 or 12 in. high, simple or branched from the base; herbage finely puberulent; leaves alternate or the lowest opposite, oblong, $\frac{1}{3}$ to 1 in. long, entire or dentate, only the lowest petioled; flowers solitary in the axils of the alternate leaves, sometimes in one of the axils of the opposite leaves, appearing racemose above by the reduction of the upper leaves to bracts; pedicels shorter than the small white flowers or obcordate capsules.

Common in low places in valley fields: Coast Ranges; plains of the Sacramento and San Joaquin; Southern California. May.

3. *V. americana* Schwein. BROOKLIME. Glabrous perennial; stems erect or ascending, 1 to 2 ft. long; leaves oblong-ovate, serrate, $1\frac{1}{2}$ to 3 in. long, short-petioled, bearing peduncled racemes in their axils; pedicels filiform, exceeding the linear-oblong bracts and much longer than the rotund capsule; corolla blue.

Springs and rivulets in the hills and mountains. Coast Ranges; Sierra Nevada. June.

17. CASTILLEIA Mutis.

Root-parasitic herbs or sometimes suffrutescent plants, of hilly districts. Leaves alternate, sessile, entire or more commonly lacinate. Flowers dull yellowish or greenish, in terminal spikes (rarely pediceled), the bracts and calyx-lobes commonly more showy than the dull yellow or greenish corolla. Calyx tubular, flattened laterally, cleft before and usually behind, the divisions entire, emarginate or 2-cleft. Upper lip (galea) of the corolla long and narrow, flattened laterally (or conduplicate) and enclosing the style and the 4 unequal stamens. Lower lip very short, 3-lobed or -toothed. Anther cells unequal, the outer versatile, the inner pendulous. Capsule many-seeded. (D. Castillejo, Spanish botanist.)

Annual; calyx about equally cleft before and behind, wholly green; corolla straight, exerted from the calyx-tube and exposing the short scarlet lower lip. 1. *C. stenantha*. Perennials.

Calyx much more deeply cleft before than behind; corolla falcate, the galea well exerted from lower side of calyx and exposing the lower lip.....2. *C. affinis*.

Calyx qually cleft before and behind; galea included or little exerted (the lower lip never exposed).

Calyx-lobes mostly 2-cleft to middle; herbage villous-hirsute; leaves linear.....3. *C. parviflora*.

Calyx-lobes entire or with slightly 2-lobed summit.

Herbage viscid-pubescent; leaves oval or obovate.....4. *C. latifolia*.

Herbage white-woolly throughout; leaves linear.....5. *C. foliolosa*.

1. *C. stenantha* Gray. Annual, erect, virgate, $1\frac{1}{4}$ to $2\frac{1}{2}$ ft. high, the whole plant glandular-pubescent and wet as if with dew; leaves ascending, linear-lanceolate, $1\frac{1}{2}$ to 3 in. long, all entire; lower leaves with long linear tips, these coiling spirally when wilting; bracts entire, the uppermost with scarlet tips; lower flowers pedicellate; calyx equally cleft or cleft slightly deeper behind; calyx-lobes incisely 2-cleft at apex; corolla wholly green (except the lower lip) or sometimes slightly yellowish, straight, well-exserted from calyx-tube, exposing the bright scarlet teeth of the lower lip; corolla-tube longer than galea.—(*C. spiralis* Jepson.)

Moist rivulets: northern Napa Co.; Monterey to San Diego; southern Sierra Nevada. The only annual species in the State.

2. *C. affinis* H. & A. SCARLET CUP. One to 2 ft. high, with few virgate branches from the base, rather leafy below; herbage nearly glabrous, somewhat villous, or slightly scabrous-puberulent; leaves linear, entire, 4 in. long or less; raceme loose below; bracts scarlet, 3-parted, the middle lobe largest and 3-cleft at apex; flowers pediceled, $1\frac{1}{4}$ in. long; calyx-lobes notched or 2-cleft at apex, the teeth acute; corolla yellowish, falcate, much exerted from the anterior cleft of the scarlet or scarlet-tipped calyx, and exposing the lower lip; galea about as long as tube, villous, bearded towards apex on the back.

Borders of woods in the Coast Ranges about San Francisco Bay: Oakland Hills; San Francisco, etc. Mar.-May. The large lower leaves have three strong callous nerves. Bracts very long, the lobes rather narrow, not broader above. Difficult to discriminate from the next; best known by its bright scarlet pediceled flowers, callous-nerved leaves, and the at length rather loose raceme.

3. *C. parviflora* Bong. var. *douglasii* Jepson. INDIAN PAINT BRUSH. Stems from base rather few; herbage villous-hirsute; leaves linear, varying to linear-lanceolate or -oblong, entire or with a few linear-lacinate lobes, $1\frac{1}{2}$ to

2½ (or the lower even 3¼) in. long; bracts petal-like above, equally 3-parted or the middle lobe somewhat larger and 3-cleft at summit; spikes lax below; calyx-lobes red, rarely yellow, laciniately 2-cleft at summit or to below the middle; corolla straight, the galea about as long as tube, little or not at all exerted.—(*C. douglasii* Benth.)

Wooded cañons: Coast Ranges and Sierra Nevada. Common and variable. Bracts variable in color, tipped with red, yellow, or white. The bracts of the yellow form from the Oakland Hills are not cleft to the middle.

4. *C. latifolia* H. & A. SEASIDE PAINTED CUP. One-half to 1½ ft. high; herbage viscid-pubescent; leaves thick, oval or obovate, mostly less than 1 in. long, or the upper larger and 3-lobed at apex; bracts very short and broad (about 9 lines long and 5 lines wide) with oblong lobes, the middle lobe twice as large as the lateral; calyx-lobes broad, entire or notched at apex, almost equaling the corolla; corolla small, about 8 lines long; lower lip very short.

Sea cliffs and rocky headlands along the coast: San Francisco: Monterey, etc. Aug.

5. *C. foliolosa* H. & A. WOOLLY PAINTED CUP. Suffrutescent, with many stems from the base, mostly 10 to 18 in. high, white-woolly throughout; leaves linear and entire, rather crowded below and fascicled in the lower axils, about 1 in. long or less, the upper cauline and bracts 3-parted into linear lobes; bracts with lobes spatulate-dilated at apex, the middle lobe largest and again shallowly 3-lobed; spikes dense; flower about 9 lines long, only slightly curved; galea protruding from calyx only 1 or 2 lines, shorter than or as long as tube of corolla; calyx-lobes truncate or merely retuse; capsule 7 lines long; seeds bluish green.

Dry Coast Range hills, mostly in rocky situations or on gravelly soil, in some places exceedingly abundant, occupying many acres of open hillside. Apr.-May.

18. ORTHOCARPUS Nutt. OWL'S CLOVER.

Annual herbs, or a few perennial species extra-limital. Leaves alternate, incised or laciniate, the floral sometimes colored. Flowers in terminal spikes. Calyx tubular or short-campanulate, 4-cleft, or cleft before and behind and the divisions 2-lobed. Corolla tubular, the upper lip ("galea") similar to that of *Castilleja*, but not so greatly (or not at all) exceeding the lower one. Lower lip 3-saccate, inflated, often very conspicuous. Stamens 4; anthers in some species with but one cell. (Greek *orthos*, upright, and *karpos*, fruit.)

A. Bracts with colored tips.

Corolla with moderately 3-saccate lower lip, the teeth or lobes conspicuous.

Filaments glabrous; galea nearly straight, glabrous.

Flowers whitish; spike slender, 3 in. long or more, lax below.....1. *O. attenuatus*.

Flowers dull white with purple marks; spike short and dense, 2 in. long or less.....

2. *O. castilleioides*.

Flowers purple; spikes dense, cylindric.....3. *O. densiflorus*.

Filaments hairy; galea hooked at apex, bearded; flowers crimson.....4. *O. purpurascens*.

B. Bracts wholly herbaceous.

Corolla with conspicuously 3-saccate lower lip, much larger than the slender and straight (but often longer) galea.

Stamens in anthesis exerted from the scarcely folded galea; flowers ½ in. long or less.

Plants small and weak; flowers scattered, inconspicuous, dark red.....5. *O. pusillus*.

Plants larger and more vigorous; flowers in mostly dense spikes, white or cream-

color.....6. *O. floribundus*.

Stamens not exerted from the involute-subulate galea; flowers exceeding ½ in.

Leaves dissected into linear segments; tube of corolla filiform.

Herbage greenish; corolla yellow or pinkish white, no markings or inconspicuous

- ones on lip; galea and tube whitish.....7. *O. faucibarbatulus*.
 Herbage somewhat reddish; galea purple.
 Corolla deep sulphur-yellow8. *O. erianthus*.
 Corolla white or rose-color: vars. of8. *O. erianthus*.
 Leaves broader, entire or with few segments; corolla-tube broader and dilated upwards; herbage somewhat yellowish; corolla cream-color throughout.....9. *O. lithospermoides*.

1. *O. attenuatus* Gray. Slender, strict or more rarely with a few branches, 5 to 12 in. high; leaves linear-lanceolate, attenuate, entire or the upper with one or two filiform lobes above the middle, 3 in. long or less, mostly 1, or sometimes 5, lines wide; spikes slender, loose below, denser above; bracts with white tips or almost wholly herbaceous; calyx-lobes 4, filiform, the divisions of nearly equal depth; corolla dull white, not deeply bilabiate; lower lip shallowly saccate, purple-dotted, its lanceolate teeth large for the size of the corolla, almost as long as the saccate portion and nearly or quite equaling the galea.

Fields: Coast Ranges; Great Valley; Sierra Nevada foothills and far northward. Apr.-May.

2. *O. castilleioides* Benth. Corymbosely branched from the base, commonly 6 to 10 in. high, somewhat hirsute-pubescent; leaves broader than in the preceding, 4 lines wide or less, entire or with lacinate linear divisions; spikes short and dense, or even subcapitate, the bracts with white or yellowish tips; calyx-segments linear; corolla 6 to 10 lines long, dull white with purple marks; galea plainly longer than the bright crimson teeth.

Marshy ground near the coast: Alameda; West Berkeley; Napa Valley; Sonoma Co. and northward to Washington. June.

3. *O. densiflorus* Benth. ESCOBITA. Strict or strictly branched, 5 to 15 in. high, finely pubescent; leaves oblong-lanceolate to linear, with mainly a pair of filiform or slender divisions; spike dense, 4 in. long or less; bracts 3-cleft with purple and white tips; calyx-segments spatulate-dilated, purple; corolla 8 to 10 lines long, purple and white; lower lip with large crimson dots, the teeth nearly as long as the galea.

Valley fields and low hills, common: Calistoga; San Rafael; Mill Valley; Newark, etc., and southward along the coast to San Luis Obispo. May.

4. *O. purpurascens* Benth. OWL'S CLOVER. Erect or frequently much branched from the base with ascending branches, 4 to 15 in. high, villous-pubescent; leaves parted into many filiform divisions, which are often brownish tinged; spike thick and dense, 2 to 4 in. long; bracts dilated at base, palmately cleft into filiform or narrowly linear lobes, the upper with crimson or purple spatulate-dilated tips, as also the calyx-lobes; calyx more deeply cleft behind than before; corolla crimson or purplish, 1 to 1¼ in. long; lower lip white-tipped, with yellow and purple dots or markings; galea densely purple-bearded on the back, incurved at tip.

Sierra Nevada foothills; Sacramento and San Joaquin valleys; North Coast Ranges and southward to Southern California. Common. Apr.-May.

5. *O. pusillus* Benth. Slender and weak, 2 to 4 in. high; herbage purplish, sparingly hispidulous-pubescent; leaves pinnately cleft into linear or filiform divisions; bracts longer than the scattered inconspicuous dark red flowers; corolla 2 to 3 lines long.

Hillsides and fields, coloring moist spots with a dull red hue: Oakland Hills; Marin Co.; Napa Valley; Humboldt Co. and northward. Often parasitic on grasses (J. B. Davy). Mar.-Apr.

6. *O. floribundus* Benth. Erect, somewhat corymbosely branched from

near the base or the middle, 5 to 12 in. high, nearly glabrous; leaves (especially the upper) pinnately parted into linear-filiform divisions, some again parted; spikes short and dense, the upper bracts not surpassing the calyx; corolla white or cream-color, 6 lines long, its tube much exceeding the calyx; lower lip with 2 hairy lines within.

Hillsides near the coast: Millbrae; San Francisco.

7. *O. faucibarbatum* Gray. Plants 7 to 14 in. high, commonly with ascending branches from the middle; herbage greenish, glabrous, or puberulent above; leaves oblong or ligulate at base, pinnately cleft above into several linear divisions; spikes at length elongated and lax; bracts shorter than the flowers, palmately cleft or parted into lanceolate segments; corolla yellow or pinkish white, 9 to 10 lines long, its tube whitish, very slender, pubescent, twice the length of the calyx; sacs of lower lip nearly 2 lines deep, deeper than high.

Low fields in the Coast Range valleys from Monterey Co. and Santa Cruz to Napa Valley, Sonoma Co. and Eureka. Apr.-May. Sometimes the lips of the corolla deflex in age and widely gap.

8. *O. erianthus* Benth. JOHNNY-TUCK. Simple or commonly branching, 5 to 8 in. high; herbage, particularly the bracts and stems, reddish; leaves pinnately divided into filiform divisions; spikes slender; bracts much shorter than the flowers; corolla about 10 lines long and sulphur-yellow except the dark purple subulate galea, its filiform tube at least twice the length of the calyx; sacs of the lower lip 2 lines deep, deeper than high, each sac commonly with 2 greenish yellow spots at the base of the tooth; folds of the throat densely bearded.

Very abundant on the plains of the Sacramento and San Joaquin valleys and on the low hills of the Coast Ranges, often coloring wide stretches with streamer-like bands of yellow in Apr. and May. Var. *VERSICOLOR* Jepson. Popcorn Beauty. Corolla white, excepting the purple galea, often with a transverse purple band across the throat below the sacs; otherwise like the species.—San Francisco. Var. *ROSEUS* Gray. Corolla rose-color.—San Francisco sand hills.

9. *O. lithospermoides* Benth. CREAM SACS. Stem erect and simple, rarely with a few branches above the base, 8 to 12 (or 14) in. high; herbage hirsute-pubescent above, less so below; lower leaves lanceolate, entire; upper oblong, with a few slender lobes; spike very dense and thick; bracts nearly equaling the flowers, the upper dilated at the base, palmatifid into 7 or more narrow lobes; corolla 1 in. long or more, of a rich cream-color, strongly 3-saccate, the tube dilated upwards.

Plains and low hills: Palo Alto; Berkeley; Contra Costa; Marin, Sonoma and Napa cos. northward through the Coast Ranges to Mendocino; Sacramento Valley. Apr.-May. Upper bracts large, almost as broad as long, concealing the calyx; in the two preceding species the upper bracts are small, little or not at all longer than the calyx, only 3 to 5-cleft and not so broad.

19. *CORDYLANTHUS* Nutt. Bird's Beak.

Branching annuals. Leaves alternate, narrow, either entire or 3 to 5-parted into linear divisions. Bracts and calyx never colored. Flowers scattered along the branches or in terminal clusters or heads. Calyx spathe-like, consisting of an upper and a lower leaf-like division or the lower division wanting. Corolla tubular, enlarged a little upwards, the lips of nearly equal length; lower lip obtusely 3-toothed. Stamens 4 or 2; anther-cells unequal, ciliate or minutely bearded. Capsule flattened; seeds with a loose coat, pointed at one

end. (Greek cordule, club, and anthos, flower, in reference to the shape of the corolla.)

Calyx diphyllous (*i. e.*, with upper and lower leaf-like divisions); stamens 4, filaments villous; bracts and floral leaves gland-tipped.—Subgenus *ADENOSTEGIA*.

Flowers crowded into terminal heads; bracts hirsute-ciliate.....1. *C. rigidus*.
Flowers 2 or 3 together at the ends of the branchlets, or only one.

Herbage pubescent2. *C. pilosus*.

Herbage glabrous3. *C. pringlei*.

Calyx monophyllous (*i. e.*, with a single upper leaf-like division); filaments glabrous; bracts and floral leaves not gland-tipped.—Subgenus *HEMISTEGIA*.

Leaves entire; stamens 44. *C. maritimus*.

Some of the leaves pinnatifid; stamens 25. *C. mollis*.

1. *C. rigidus* Jepson, n. comb. Erect, paniculately branched, 1 to 2 or 3 ft. high; herbage finely puberulent, the 3-parted bracts hispid-ciliate; lower leaves entire, upper 3 to 5-parted into linear divisions, their tips dilated and retuse; flowers crowded in terminal heads; corolla yellowish and purplish, over $1\frac{1}{2}$ in. long.—(*Adenostegia rigida* Benth. *C. filifolius* Nutt.)

Throughout Southern California and north into the southern Sierra Nevada, in the Coast Ranges reaching the Santa Cruz and Mt. Hamilton ranges.

2. *C. pilosus* Gray. Paniculately branched, 2 to 3 ft. high, glandular, soft-pubescent; leaves narrowly linear, entire, somewhat fascicled below, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the upper and floral with 1 to 3 callous-glandular teeth at the dilated tip; flowers 2 or 3 together at the end of the branchlets, or only 1; calyx-lobes exceeding the corolla; corolla $\frac{1}{2}$ in. long, dull white or yellowish; lower lip rather broad below, scarcely shorter than the upper; stamens 4; anthers 2-celled; filaments villous.—(*Adenostegia pilosa* Greene.)

Very common on dry hills throughout northern California: Los Gatos; Moraga Valley; San Rafael; Napa Valley; Vaca Mts. and northward. Sept.

3. *C. pringlei* Gray. Diffusely and subdivaricately branched, the branches slender and very wiry, about $1\frac{1}{4}$ ft. high; glabrous below, the inflorescence sparsely sprinkled with minute glandular-hispid hairs; leaves filiform, 6 lines long, the floral somewhat callous-tipped; flowers few, solitary, terminating the stem and branches; upper calyx-division narrow, bifid; corolla 5 to 6 lines long, white or greenish white, marked with purple at the middle; capsule oblique at summit, with a very distinct beak.—(*Adenostegia pringlei* Greene.)

Higher summits and very local: Mt. St. Helena; Lake Co. The plant in anthesis is almost or quite leafless and the rigid wiry branches of a deep brown or mahogany color are quite characteristic. This and the preceding species belong to the subgenus *Adenostegia*, characterized by a diphyllous calyx; it is to be noted, however, that the lower sepal in *C. pringlei* and *C. pilosus* is deciduous, and that only the upper sepal persists in extreme age! The next two species are of the subgenus *Hemistegia*, the calyx of which is monophyllous, only the upper sepal being present.

4. *C. maritimus* Nutt. Corymbosely branched, 5 to 12 in. high; herbage glaucous and more or less hoary-pubescent; leaves linear to oblong, 1 in. long, entire; flowers in short rather thick spikes, about as long as the loosely imbricated bracts; corolla purplish; stamens 4, in very unequal pairs; anthers of the longer pair 2-celled, of the shorter pair with only the lower smaller cell; filaments glabrous.—(*Adenostegia maritima* Greene.)

Salt marshes near the coast from San Francisco Bay southward to Southern California. July.

5. *C. mollis* Gray. Simple or branched, $\frac{1}{2}$ to 1 ft. high, villous-pubescent, the bracts densely villous-hirsute; leaves linear or oblong, entire, or the upper

saliently few-toothed or pinnatifid; flowers spicate; corolla $\frac{3}{4}$ in. long; stamens 2; anthers 2-celled; filaments glabrous.—(*Adenostegia mollis* Greene.)

Interior salt marshes: Vallejo; Suisun Marshes. Aug.

20. PEDICULARIS L. LOUSEWORT.

Perennial herbs with alternate pinnatifid leaves. Flowers in a bracteate spike-like raceme. Calyx 2 to 5-cleft. Corolla tubular, strongly bilabiate; upper lip galeate, arched and compressed; lower lip of 3 small rounded lobes or teeth. Stamens 4, under the galea; anthers transverse, with equal cells. Capsule flattened, oblique at apex, loculicidally 2-valved. (Latin *pediculus*, a louse; of uncertain application.)

1. *P. densiflora* Benth. INDIAN WARRIOR. Stems simple and erect, 9 to 12 in. high, commonly several from the scaly caudex; herbage soft-pubescent or nearly glabrous; leaves pinnately divided or parted, the segments oblong and doubly serrate-toothed or incised; flowers in a terminal dense (or in age loose) raceme; bracts linear, ciliate or serrulate towards the apex, mostly shorter than the flowers, crimson or crimson-tipped; calyx split to the base in front, 2-toothed behind, 3 to 4 lines long; corolla crimson, pink or (in shade) white, 1 in. long or more; galea large, slightly broader upwards, strongly arched; lower lip small, of 3 rounded teeth; anther-cells acute at base; seeds few.

Wooded hills throughout western California. Feb.-Mar.

UTRICULARIACEAE. BLADDERWORT FAMILY.

Aquatic insectivorous plants. Calyx bilabiate. Corolla deeply bilabiate, the lower lip larger, 3-lobed, spurred at the base in front. Stamens 2, anterior. Ovary superior, 1-celled, with a free central placenta bearing several ovules. Fruit a 2-valved capsule. Seed with a straight embryo and no endosperm.

1. UTRICULARIA L. BLADDERWORT.

Leaves capillary divided and bearing little bladders which possess a kind of valve-like opening. Scapes 1 to few-flowered. Calyx-lips entire. Corolla with a projecting palate on the lower lip, often closing the throat; upper lip erect. (Latin *utriculus*, a little skin or leathern bottle.)

1. *U. vulgaris* L. COMMON BLADDERWORT. Immersed stems 1 ft. long or more, crowded with bi- or tri-pinnately parted leaves bearing many bladders; scapes 5 to 12-flowered; pedicels recurved in fruit; corolla 6 to 9 lines broad, with conical spur somewhat shorter than the lower lip.

Olema; Santa Rosa, *M. S. Baker*; lower San Joaquin. The bladders have an entrance closed by a valve opening inwards, so that small aquatic animals having entered are unable to escape.

OROBANCHACEAE. BROOM-RAPE FAMILY.

Root-parasitic herbs, destitute of green color, with alternate scales in place of leaves. Flowers complete. Calyx persistent. Corolla tubular, more or less bilabiate, the upper lip 2-lobed or entire, the lower 3-lobed. Stamens 4, didynamous, inserted on the tube of the corolla. Ovary superior, 1-celled, pointed with a long style which is curved at the apex. Capsule ovoid, 2 to 4-valved, each valve bearing on its face 1 or 2 placentae. Seeds numerous, very small, with endosperm; embryo minute.

Calyx 5-cleft; anther-cells separated from below upward, mucronate at base; capsule 2-valved1. OROBANCHE.
Calyx truncate behind and before, or with 1 to 4 teeth in front; anther-cells parallel, blunt; capsule 4-valved2. BOSCHNIAKIA.

1. **OROBANCHE** L. BROOM-RAPE.

Low commonly viscid-pubescent plants, with violet-purple or yellow flowers. Calyx 5-cleft into acute or acuminate lobes. Corolla tubular, curved, obscurely or manifestly bilabiate; upper lip erect or arching inwards, in ours 2-lobed; lower lip 3-lobed, spreading. Stamens included. Style deciduous; stigma peltate or with anterior and posterior lobes. Placentae 4, 2 on each valve of the capsule. (Greek orobos, vetch, and anchone, choke.)

Flowers on long slender peduncles from a short more or less subterranean caudex, without bractlets; corolla obscurely bilabiate; placentae not closely approximate in pairs.

Peduncles few or one; corolla bluish or purplish; calyx-lobes subulate....1. *O. uniflora*. Peduncles many; corolla commonly yellow; calyx-lobes broader.....2. *O. fasciculata*. Flowers in a raceme, or subsapicate, or thyrsoid, each with 2 bractlets; corolla manifestly bilabiate; placentae in contiguous pairs.

Herbage light colored or somewhat purplish; flowers pedicellate; calyx equally cleft.

Calyx-lobes nearly as long as tube of corolla.....3. *O. comosa*.

Calyx-lobes scarcely half as long as corolla.....4. *O. californica*.

Herbage dark reddish brown; flowers subsessile or short pedicelled; calyx unequally cleft; stems with a thickened tuber-like base.....5. *O. tuberosa*.

1. *O. uniflora* L. NAKED BROOM-RAPE. Peduncles few or one, slender, $1\frac{1}{2}$ to $5\frac{1}{2}$ in. high from a short scaly nearly subterranean stem; calyx-lobes subulate, often attenuate, longer than the tube; corolla violet-tinged or blue-purple, 1 in. long or less (twice the length of the calyx or more), the lobes obovate and rather large.—(*Aphyllon uniflorum* Gray.)

Widely distributed but not common: Lafayette; Napa; Howell Mt. Apr.-May.

2. *O. fasciculata* Nutt. Scaly stem emerging from the ground 1 or 2 in. and bearing numerous fascicled peduncles 3 to 4 in. long; plants more pubescent and glandular than in no. 1; calyx-lobes broadly or triangular-subulate, usually shorter than but often exceeding the tube; corolla yellow, sometimes purple or reddish tinted, 1 to $1\frac{1}{2}$ in. long.—(*Aphyllon fasciculatum* Gray.)

Higher mountain slopes and ridges, rather common: Coast Ranges; Sierra Nevada; Southern California. June. Parasitic on *Eriogonum*, *Phacelia*, *Artemisia*, etc.

3. *O. comosa* Hook. Branching close to the surface of the ground, 3 to 4 in. high, puberulent; flowers racemose or somewhat corymbose; pedicels 2 to 4 lines long; bractlets on the pedicels or at the base of the flowers; calyx parted into long linear-attenuate lobes $\frac{2}{3}$ as long as or nearly equaling the corolla; corolla pinkish or purplish, 1 to $1\frac{1}{2}$ in. long, upper lip notched or bifid, lower lip 3-parted into rather narrow lobes; anthers woolly.—(*Aphyllon comosum* Gray.)

Dry hills or low valleys, parasitic on *Artemisia* and other shrubs, usually not common in a locality. Mohave Desert; Livermore; San Joaquin and Sacramento valleys; northward to Washington. Aug.-Sept.

4. *O. californica* C. & S. Stems usually simple, 2 to 6 in. high; viscid-pubescent; flowers crowded in a dense raceme; pedicels 1 to 2 (or the lower sometimes 6) lines long; calyx-segments linear-lanceolate, half as long as the corolla; corolla yellowish or purplish, $\frac{5}{8}$ to 1 in. long, its lobes shorter and less spreading than in no. 3; anthers glabrous or slightly hairy.—(*Aphyllon californicum* Gray.)

Open hills: Coast Ranges; Sierra Nevada. Corolla rather more slender and less membranous than in *O. comosa*; lips about 2 lines long, in *O. comosa* about 3 to 4 lines long.

5. *O. tuberosa* (Gray) Heller. Low, stout, pruinose-puberulent, the thickened base of the stem with imbricated scales; inflorescence a dense pyramidal (or more or less globose) cluster of short racemes; calyx unequally cleft, the lobes about as long as the tube of the corolla; corolla yellowish or dark purple or brown, 5 to 7 lines long, the lobes a line long, scarcely spreading; anthers after dehiscence somewhat hairy.—(*Aphyllon tuberosum* Gray.)

Summits of the Coast Range peaks and ridges, parasitic on *Adenostomia fasciculatum*, and similar shrubs: Gabilan Mts.; Mt. Hamilton; Mt. Diablo; Mt. Tamalpais; Vaca Mts.; Snow Mt. May.

2. BOSCHNIAKIA C. A. Mey.

Stems thick, simple, arising from rather large globose tubers which are developed at the point of attachment of the parasite to the root of the host plant. Flowers without bractlets, sessile or pedicellate, more or less concealed by scaly subtending bracts, the whole forming a dense spike. Calyx short, cup-shaped, truncate behind and with teeth in front, or entirely truncate. Corolla ventricose; upper lip erect or fornicate, entire or bifid; lower 3-parted. Stamens slightly exserted. Stigma bilamellate, the lobes right and left, or 4-lobed. Capsule 4-valved, each valve with 1 placenta. (Boschniakia, a Russian botanist.)

1. *B. strobilacea* Gray. Tubers 2 to 3 in. in diameter, bearing 1 to 13 spikes; spikes deep red-brown in age; scales (bracts) much imbricated, very broad and obtuse; lower flowers rarely with bractlets; calyx truncate or with 1 to 4 teeth anteriorly and laterally disposed; upper lip of corolla entire, emarginate or bifid; filaments densely bearded at base.

Higher Coast Range ridges: Santa Cruz Mts., Moraga Ridge, Mt. Tamalpais, Mt. St. Helena and northward to British Columbia; commonly parasitic on the roots of Manzanita. May. The oblong spikes in many cases bear a marked resemblance to Sugar Pine cones; in other cases the inflorescence is more open and the specific name less applicable. For a detailed account see *Erythraea*, v, 63, pl. 1 & 2.

PLANTAGINACEAE. PLANTAGO FAMILY.

Acaulescent herbs with 1 to several-ribbed or -nerved radical leaves. Flowers complete, regular, 4-merous, the scarious and veinless corolla commonly withering-persistent. Ovary 2 to 4-celled, superior; style long-stigmatose, simple and filiform.

1. PLANTAGO L. PLANTAIN.

Flowers perfect or polygamo-dioecious, each subtended by a bract, disposed in spikes or heads which are raised on a leafless scape. Sepals 4. Corolla small, salverform, with a short tube, or nearly rotate. Stamens 4, or sometimes 2, alternating with the lobes of the corolla and borne on its tube. Ovary 2 or falsely 4-celled, with 1 or more ovules in each cell. Capsule circumscissile, the seeds attached to the face of the loose partition which falls away with the lid. Seed-coat mucilaginous. (Latin name of the Plantain.)

Corolla closed over the mature capsule, forming a sort of beak; perennial; stamens 4; spike 6 to 12 in. long; leaves oblong-lanceolate.....1. *P. hirtella*.
Corolla remaining expanded, not closed over the mature capsules.

Perennials; stamens 4.

Leaves lanceolate2. *P. lanceolata*.

Leaves ovate3. *P. major*.

Leaves linear4. *P. maritima*.

Annuals; leaves linear or oblanceolate.

Stamens 4; capsule 2-seeded; spike oblong.....5. *P. patagonica*.

Stamens 2; capsule 4-seeded; spike narrowly linear.....6. *P. bigelovii*.

1. *P. hirtella* H.B.K. Root thick; herbage roughish pubescent, especially the scapes and leaf-ribs; leaves oblong-oblancoolate to narrowly oblong, tapering to apex and below into a broad petiole, 3 to 12 in. long and $\frac{5}{8}$ to $3\frac{1}{4}$ in. wide; spikes 6 to 12 in. long, dense except at the base; corolla persistent, its lobes closed over the capsule, forming a sort of beak; seeds 3.

Clay banks along the coast: Marin Co. and San Francisco southward to Southern California.

2. *P. lanceolata* L. RIBWORT. ENGLISH PLANTAIN. Perennial; herbage somewhat villous with short hairs, often rusty-pilose; leaves erect or spreading, oblong-lanceolate, tapering at base into a slender petiole, strongly 3 to 5-ribbed, $3\frac{1}{2}$ to 6 in. long; scape longer than the leaves, sulcate and angular, erect; spike short-cylindrical, $\frac{3}{4}$ to 2 in. long; corolla nearly rotate; sepals scarious, the two lower often combined into one; stamens twice as long as the corolla, with slender filaments; capsule 2-seeded.

Common about San Francisco Bay. A naturalized European species which has seriously diminished the carrying capacity of cattle pastures in the Pt. Reyes country and northward to Humboldt.

3. *P. major* L. COMMON PLANTAIN. Glabrous perennial; rootstock short and thick; leaf-blades round-ovate, 3 to 6 in. long, entire or toothed, marked with 5 to 7 prominent ribs, these converging at the base into a broad petiole 4 or 5 in. long; scapes not as long as the leaves, rarely longer, bearing an elongated spike often 8 in. long; sepals green in the middle, the edges scarious; capsule 2-celled with 4 to 8 seeds in each cell, circumscissile near the middle.

Not uncommon in low fields and waste places. Probably introduced from Europe. Called by the Indians "White Man's Foot," since it has closely followed the advance of civilization, springing up about the earliest frontier settlements. It has repute in rustic medicine for the cure of certain cutaneous disorders. Var. *ASIATICA* Dec.; leaves in a rosette-like cluster, the petiole about 1 in. long or less; peduncles surpassing the leaves; spike below less dense; capsule circumscissile near the base and well within the calyx.—Stockton; Sierra Nevada.

4. *P. maritima* L. SEA PLANTAIN. Low stout maritime perennials with many thick and fleshy linear or narrowly linear leaves; scapes ascending, 3 to 4, rarely 6 to 7 in. long, equaling or exceeding the leaves; spike cylindrical, $1\frac{1}{4}$ to 2 or 3 in. long; sepals somewhat carinate; corolla-tube pubescent externally; capsules 2 to 4-seeded.

Cliffs and rocks near the sea: Santa Cruz; San Francisco; West Berkeley.

5. *P. patagonica* Jacq. var. *californica* Greene. Annual, silky-pubescent, 4 to 5 in. high; leaves narrowly linear to oblanceolate, about $\frac{2}{3}$ the length of the scapes, rarely equaling them, less than 1 to nearly 3 lines wide; spike dense and short, oblong, or even almost capitate, 4 to 6 lines long; sepals obtuse, scariously margined and with a firm and broadly linear central portion; capsule 2-seeded; seeds oblong-oval with a pronounced ventral sulcus, and tough leathery testa.

Very common on hillsides everywhere. Apr.-May. Fr. June.

6. *P. bigelovii* Gray. Slender glabrous annual, 3 to 5 in. high; leaves linear or filiform, commonly shorter than the scapes, less than 2 lines broad, both scapes and leaves erect; fruiting spike $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, about $1\frac{1}{2}$ lines wide; stamens 2; capsule ovoid-oblong, 1 to $1\frac{1}{2}$ lines long, circumscissile much below the middle (well within the calyx), 4-seeded, occasionally a fifth seed; seeds winged at one end.

Alkaline fields of the Sacramento and San Joaquin valleys westward through the South Coast Ranges. Apr.-May.

RUBIACEAE. Madder Family.

Shrubs or herbs with opposite or whorled entire leaves. Flowers perfect or polygamous, rarely unisexual. Calyx, corolla and stamens 4-merous (except *Sherardia*). Calyx coherent with the ovary, its limb sometimes obsolete. Stamens alternate with the lobes of the corolla and inserted on its tube. Ovary 2 to 5-celled; styles 1 or 2. Embryo in fleshy or horny albumen.—A very large order including the Cinchona and Coffee Plant.

Herbs or slightly suffrutescent plants.

- Corolla rotate; flowers in cymes or solitary, pediceled.....1. *GALIUM*.
 Corolla funnellform; flowers in involucrate heads.....2. *SHERARDIA*.
 Large shrub; corolla tubular-funnelform; flowers in dense globose long-peduncled heads...3. *CEPHALANTHUS*.

1. *GALIUM* L. BEDSTRAW. CLEAVERS.

Herbs or some species slightly suffrutescent, with slender square stems. Leaves exstipulate, in whorls. Flowers cymose, peduncled. Calyx-limb obsolete. Corolla rotate, 4-lobed. Stamens 4, short. Ovary 2-lobed, 2-celled, 2-ovuled; styles 2. Fruit didymous, of two globular halves, dry or fleshy, separating when ripe into 2 seed-like indehiscent 1-seeded carpels. (Greek gala, milk, certain species being used to curdle milk.)

A. Annuals.

- Mature fruit dry; leaves 6 to 8 in a whorl.
 Pedicels curved in fruit1. *G. tricornne*.
 Pedicels straight in fruit.
 Fruit granulate or tuberculate but glabrous2. *G. parisiense*.
 Fruit densely uncinat-hispid3. *G. aparine*.

B. Perennials.

- Mature fruit dry.
 Leaves 6 in a whorl, cuspidate-acuminate.....4. *G. triflorum*.
 Leaves 4 or 5 in a whorl, obtuse at apex5. *G. trihdum*.
 Mature fruit fleshy or berry-like; leaves in whorls of 4.
 Herbaceous; corolla yellowish6. *G. californicum*.
 Suffrutescent; corolla white7. *G. nuttallii*.
 Herbaceous; corolla purple8. *G. bolanderi*.
 Prostrate; corolla white9. *G. andrewsii*.

1. *G. tricornne* Stokes. CORN GALIUM. Stems stout, rather simple, 6 to 10 in. long, the angles callous, with stoutish recurved prickles; leaves in whorls of 6 to 8, narrowly oblanceolate or linear, callous-margined and thickly beset with recurved prickles, about 6 lines long; fruit on stout recurved pedicels, 1½ lines long, papillate-rugose, 2 lines broad or more.

Naturalized from Europe; Kenwood, Sonoma Co. Fruiting in June.

2. *G. parisiense* L. WALL GALIUM. Much branched from the base, the branches and particularly the branchlets very slender or almost filiform, 10 to 16 in. high, very leafy below, less so above, finely scabrous; leaves in whorls of 6, oblong-spatulate or linear-oblong, acute, 3 to 5 lines long; cymes several-flowered, paniculate, the peduncles and pedicels filiform; flowers whitish, very small, ¼ to ½ line broad; fruit small, glabrous, granulate.—(*G. anglicum* Huds.)

Vineyards at Sonoma. Introduced from Europe. July.

3. *G. aparine* L. GOOSE GRASS. Diffuse or climbing over herbaceous plants and forming rather thick coarse mats, the stems 1 to 2 or 3 ft. long, the whole herbage setulose or hispidulous-roughened; leaves in whorls of 7 or 8, oblong-oblanceolate, obtuse, or the upper acute, mucronate, tapering to

a rather narrow base, $\frac{1}{2}$ to $1\frac{1}{4}$ or 2 in. long; flowers white or whitish; fruit thickly beset with whitish hooked bristles.

Common in half shaded or grassy places among the hills. Widely distributed. Apr. Fr. in May.

4. *G. triflorum* Michx. SWEET-SCENTED BEDSTRAW. Decumbent or reclining, with numerous mostly simple stems from the base, 7 to 12 in. long, retrorsely scabrous on the angles or smoothish; leaves mostly in 6s, oblong-oblancoate, rather abruptly bristle-pointed, the midrib and the upper surface near the margin somewhat scabrous, 3 to 6 lines long; axillary peduncles once di- or tri-chotomous, 3 to 6 lines long; pedicels bractless, but the pedicels of the terminal peduncles with mostly whorled bracts; corolla purplish or greenish; fruit 1 line or less broad, beset with slender hooked bristles; endosperm lunate in cross-section.

Edges of woods: San Mateo and northward; Sierra Nevada.

5. *G. trifidum* L. Stems slender and weak, ascending, 5 to 18 in. high, the angles comparatively smooth; leaves in whorls of 4 or 5, thin, oblong, obtuse, not bristle-pointed, obscurely scabrous on the margins, $1\frac{1}{2}$ to 6 lines long; flowers minute; peduncles mostly scattered; fruit smooth; endosperm annular in cross-section.

Coast Ranges (but not common); Sierra Nevada.

6. *G. californicum* H. & A. CALIFORNIA GALIUM. Stems from slender rootstocks, erect and numerous, forming a low tuft, 6 to 8 in. high, or diffuse and 1 ft. long; herbage hispid with widely spreading stiff hairs; leaves thinish, ovate or oval, apiculate-acuminate, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the margins and midrib hispid-ciliate; flowers dioeciously polygamous, the fertile solitary on short peduncles at the branches or in the forks, the sterile ones terminal in 3s; corolla yellowish with ovate-lanceolate lobes; fruit purple, glabrous or nearly so.

Common on open hills of the Coast Ranges: Humboldt Co. to Southern California.

7. *G. nuttallii* Gray. Suffrutescent, often climbing 2 to 5 ft. high on bushes, glabrous and nearly smooth, the angles of the stem and margins of the leaves roughened or hispidulous; leaves in whorls of 4, thickish, oval to linear-oblong, mucronulate or obtuse, mostly $1\frac{1}{2}$ to 2 or sometimes 3 lines long; fruit smooth and glabrous, purple, 2 lines broad.

Common in Coast Range thickets: Cloverdale and Mt. Diablo to San Diego. Mar.

8. *G. bolanderi* Gray. Erect, stems 10 to 14 in. high, forming a thick tuft; angles of the stems scabrous; leaves oblong, acute, usually narrowed at base, hispid-ciliate, 2 to 3 (or the lower 4) lines long; cymes several-flowered, paniculate; pedicels about the length of the flowers, in fruit recurved or arcuate; corolla deep red-purple, with ovate acute lobes; ovary glabrous, rugose.

North Coast Ranges; Sierra Nevada.

9. *G. andrewsii* Gray. Densely matted on the ground, the prostrate stems rooting at the joints, 2 to 4 in. long; herbage grayish, sparsely scabrous or smooth; leaves crowded and fascicled in the axils, in whorls of 4, subulate, pungent, rigid, 2 to 4 lines long; flowers solitary or in 3s, terminating the branchlets, very small, perfect; corolla white; fruit on short somewhat recurved pedicels, 1 to $1\frac{1}{2}$ lines wide, glabrous.

High dry ridges of the inner Coast Ranges.

KELLOGGIA GALIODES Torr. Slender perennial herb with opposite leaves and interposed stipules, flowers on loose forking cyme terminal on stem or few branches, greenish yellow funnelform corolla 3 lines long, and densely uncinat-hispid fruits.—Sierra Nevada, common.

2. *SHERARDIA* L.

Slender annual with square stems and whorled exstipulate leaves. Flowers small, blue or pinkish, in heads surrounded by a deeply divided involucre. Calyx-limb of 4 to 6 teeth, which grow after flowering and crown the fruit. Corolla funnelform, the limb 4 or 5-lobed. Stamens 4 or 5. Style filiform, slightly 2-cleft. Fruit dry, didymous, separating into 2 indehiscient 1-seeded carpels. (Dr. Wm. Sherard, a patron of Dillenius and friend of John Ray.)

1. *S. arvensis* L. FIELD MADDER. Three to 6 in. high, hispidulous-roughened or nearly glabrous; leaves in whorls of 4 to 6, lanceolate to oblong, pungent; flowers subsessile, 2 or 3 in a head; involucre in fruit 3 to 4 lines long, its lobes 6 to 8, ovate or ovate-lanceolate.

Bay region, becoming widely naturalized in pasture lands near the coast: San Mateo north to Olema. Often matting the ground closely.

3. *CEPHALANTHUS* L. BUTTON BUSH.

Shrub or small tree with opposite or ternate leaves. Flowers densely aggregated into spherical peduncled heads. Calyx-tube inversely pyramidal, the limb 4-toothed. Corolla narrowly funnelform, slender, the small limb 4-cleft. Style filiform, much exserted; stigma capitate. Fruit dry and hard, obpyramidal, at length splitting from the base upwards into 2 to 4 one-seeded achene-like portions. (Greek *kephale*, a head, and *anthos*, a flower.)

1. *C. occidentalis* L. BUTTON-WILLOW. Shrub or tree, 6 to 20 (or 30) ft. high; bark clay-gray, young branches reddish; leaves elliptic to oblong-ovate, slightly attenuate, truncate or obtuse at base, entire, $2\frac{1}{4}$ to $3\frac{1}{4}$ in. long, on petioles 2 lines long, with short intervening stipules; peduncles 1 to 3 in. long; heads $\frac{3}{4}$ to 1 in. in diameter; calyx greenish; corolla white, 4 lines long, the segments obtuse, tipped with black; fruit nearly 2 lines long; seed 1 line long, flattened, acutely margined.

Common along interior streams, especially the San Joaquin and Sacramento rivers; Sierra Nevada foothills. Fruiting heads and fruits recalling those of the Sycamore. Aug.-Sept.

CAPRIFOLIACEAE. HONEYSUCKLE FAMILY.

Erect or twining shrubs. Leaves opposite, simple or compound, without stipules or with false foliaceous appendages resembling stipules. Flowers complete. Calyx-tube adnate to the ovary, the toothed limb commonly insignificant. Corolla regular or irregular, 5-merous or rarely 4-merous. Stamens (in ours) as many as the lobes of the tubular or rotate corolla and inserted on its tube or base. Ovary 2 to 5-celled; style 1, elongated or short or hardly any. Fruit in ours a berry or berry-like drupe. Seed-coat adherent to the fleshy endosperm; embryo small.

Leaves pinnately compound; corolla rotate, regular; deciduous shrubs or small trees with compound inflorescence 1. *SAMBUCUS*.
Leaves simple.

Berry snow-white; corolla open-campanulate or tubular-funnelform, regular; deciduous shrubs 2. *SYMPHORICARPOS*.

Berry red or black; corolla tubular, commonly irregular 3. *LONICERA*.

1. *SAMBUCUS* L. ELDER.

Shrubs or small trees with odd-pinnate leaves and serrate leaflets. Flowers small, white, in cymes collected in a terminal compound cluster, jointed with their pedicels. Calyx 5-toothed. Corolla regular, rotate, deeply 5-lobed. Ovary 3 to 5-celled; style short; stigmas 3 to 5; ovules solitary, suspended from the summit of each cell. Fruit small berry-like drupes, with cartilaginous nutlets. (Greek sambuke, a musical instrument, said to have been made of Elder wood.)

Flowers in a flat cyme; berry blue with a bloom; winter buds very small.....1. *S. glauca*.
Flowers in a thyrsoid panicle; berry scarlet or blue, without bloom; winter buds large,
the scales broad, $\frac{1}{4}$ to $\frac{3}{4}$ in. long.....2. *S. racemosa*.

1. *S. glauca* Nutt. BLUE ELDERBERRY. Bushy or arborescent, 6 to 25 ft. high; leaves compound with 5 to 7 leaflets; leaflets coriaceous, glabrous, ovate to oblong-lanceolate, serrate except at the abruptly acuminate apex, 1 to 4 in. long; flowers $2\frac{1}{2}$ to $3\frac{1}{2}$ lines broad, aggregated in a terminal flat-topped cluster 2 to 6 in. broad, consisting of one to several 5-rayed cymes; berries 2 lines in diameter, blue beneath the white bloom.

Open woods or cañons of the lower hill country or at middle altitudes, or along stream-banks in the valleys: Coast Ranges; Sacramento and San Joaquin valleys; Sierra Nevada. Fl. May to Aug. Fr. Aug.-Sept. The berries are used in cookery. The straight shoots furnished arrow shafts for the Indians.

2. *S. racemosa* L. var. *callicarpa* Jepson. RED ELDERBERRY. Low or arborescent and 20 ft. high; leaflets thinnish, mostly obovate or oblong, commonly acuminate, sharply serrate to the very apex, glabrous above, pubescent with short appressed hairs beneath, 2 to 7 in. long; inflorescence thyrsoid-paniculate, ovate in outline, $2\frac{1}{2}$ to 3 in. high; berries scarlet or black without bloom, 2 lines broad; fruiting clusters 2 to 5 in. across, very showy.

Pescadero Creek; Berkeley Hills; Marin Co. and northward along the coast to Mendocino. Apr.

2. *SYMPHORICARPOS* L.

Low and branching bushes with small short-petioled simple leaves and scaly leaf-buds. Flowers bibracteolate, white or rosy-tinged, in close short spikes or clusters. Calyx with a globular tube and 4 or 5-toothed limb; limb short, persistent. Corolla regular, open-campanulate or tubular-funnelform, 4 or 5-lobed, the stamens inserted on its throat, in ours included. Ovary 4-celled, each of the 2 lateral cells with a single fertile ovule, the two median cells containing several ovules, none of which develop. Fruit a white berry with bony seeds. (Greek sumphoreo, to bear together, and karpos, fruit, the berries in close clusters.)

Plants 3 or 4 ft. high; leaves mostly 1 in. long, entire or lobed.....1. *S. racemosus*.
Plants low, about 1 ft. high; leaves mostly $\frac{1}{2}$ in. long, commonly entire.....2. *S. mollis*.

1. *S. racemosus* Michx. SNOW BERRY. Erect or spreading, with slender branches, commonly 3 to 4 ft. high; leaves round-oval to ovate or oblong, entire or on the same branchlet sinuately few-toothed or saliently lobed, glabrous or the lower surface pubescent, commonly 1 (less commonly as much as 2) in. long, short-petioled; calyx-lobes ciliate; corolla pinkish, 2 lines long, 5-lobed above the middle, densely villous-hirsute within; berry globose, 4 to 6 lines in diameter; pulp snowy, nearly tasteless.

Very common throughout California in the hill country. Berries said to poison children.

2. *S. mollis* Nutt. Low diffuse shrub about 1 ft. high, of somewhat

more delicate habit than the preceding and with thinner leaves; leaves oval or elliptic, mostly $\frac{1}{2}$ in. long, seldom other than entire, pubescent on both surfaces or more so on the lower surface; corolla rose-red, barely pubescent within, otherwise like the last.

Coast Ranges, not common (Mt. Diablo, Monterey, San Luis Obispo Co.); Sierra Nevada. Apr.-May.

S. OREOPHILUS Gray. Corolla tubular-funnelform, 5 or 6 lines long.—High Sierra Nevada.

3. LONICERA L. HONEYSUCKLE.

Erect or twining shrubs with simple entire leaves, one or two pairs beneath the inflorescence often connate-perfoliate. Flowers spicate at the ends of the branches or in small axillary clusters. Calyx-tube ovoid or almost globose, the limb 5-toothed or truncate, deciduous or persistent, mostly small, sometimes none. Corolla with an elongated tube more or less gibbous at base; limb bilabiate with the upper lip 4-lobed or -toothed, or regular and the 5 lobes scarcely unequal. Stamens 5, inserted on the tube of the corolla. Ovary 2 or 3-celled, becoming a few- to several-seeded berry. (Adam Lonitzer, a German herbalist of the 16th century.)

Erect shrubs; flowers in pairs on an axillary peduncle; corolla nearly regular.....

1. *L. involucrata*.

Twining shrubs; flower-whorls in terminal spikes; corolla irregular.

Flowers pink; leaves, except the lowest, with stipule-like appendages; corolla hispidulous-glandular without

2. *L. hispidula*.

Flowers yellow; leaves mostly without stipule-like appendages; corolla glabrous without...

3. *L. interrupta*.

1. *L. involucrata* (Richards) Banks. BLACK TWIN-BERRY. Erect shrub, 4 to 7 ft. high; leaves opposite (or, on the lower portion of the season's shoot, ternate), oblong, varying to ovate or lanceolate, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, on very short petioles; flowers sessile, borne in pairs, side by side on axillary peduncles and subtended by conspicuous broad bracts which become reddish in age; peduncles solitary in the axils, $\frac{1}{2}$ in. in fruit, 1 in. long; corolla saccate-gibbous on the upper side at base and with 5 subequal spreading lobes, 8 lines long, yellow within and without, or somewhat crimson-tinged exteriorly, viscid-pubescent; filaments coalescent with the tube about midway; berries black, 3 to 5 lines in diameter, disagreeable to the taste.

Along cañon streams in the mountains throughout California. Mar.-May. Not reported from inner Coast Range.

L. CONJUGIALIS Kell. Bracts minute at the base of the partly or wholly united ovaries; corolla dark purple, bilabiate, the broad upper lip barely 4-toothed.—Sierra Nevada. *L. COERULEA* L. Bracts 2, linear-subulate, longer than the united ovaries; corolla yellowish white; berry blue.—Sierra Nevada.

2. *L. hispidula* Dougl. var. *californica* (Greene) Jepson. CALIFORNIA HONEYSUCKLE. Climbing bushes or trees 6 to 20 ft. high, the woody trunk sometimes 1 in. in diameter and the ultimate branches often 3 or 4 ft. long and drooping; leaves more or less glaucous, oblong, ovate, or elliptic-oblong, truncate or subcordate at base, 2 to 3 in. long, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. wide, short-petioled and all except the lowest with conspicuous rounded connate-perfoliate stipule-like appendages; corolla pink, 6 to 7 lines long, glandular-hispidulous without, the tube within and the lower portion of the filaments very hairy; anthers exserted; berries red.

Frequent in cañons and along streams of the Coast Ranges: Santa Cruz; Berkeley; Napa Valley. Also Sierra Nevada. Apparently not in the inner Coast Ranges.

3. *L. interrupta* Benth. CHAPARRAL HONEYSUCKLE. Stems with a rigid woody trunk 1 ft. or so high, the branches climbing or reclining on bushes; leaves orbicular to elliptic-oblong or -ovate, green above, glaucous beneath, $\frac{3}{4}$ to 1 in. long, on petioles $\frac{1}{4}$ in. long, mostly without interfoliar appendages; flowers yellow, in whorls in an interrupted spike; spikes 2 to 5 in. long, peduncled, terminal and solitary or with several additional from the axils of the uppermost leaves, 1 to 3 pairs of which are connate-perfoliate; corolla 4 or 5 lines long, glabrous exteriorly, and nearly so within; filaments hairy towards the base.

Dry slopes and ridges, climbing 2 to 4 ft. high on bushes of the chaparral: middle and inner Coast Ranges; Sierra Nevada. June-July. Var. *SUBSPICATA* (Gray) Jepson. Moronel. Uppermost leaves distinct and often very narrow; inflorescence paniculate.—Corral Hollow southward to San Diego.

VALERIANACEAE. VALERIAN FAMILY.

Ours annual herbs with opposite leaves. Flowers mostly perfect, borne in a cymose inflorescence. Corolla epigynous, bilabiate to regularly 5-lobed, the 1 to 3 stamens borne on its tube. Calyx-tube adnate to the ovary, its limb obsolete (in ours) or pappus-like. Ovary commonly 3-celled, the two lateral cells reduced to mere nerves, or enlarged and forming wings to the central cell which is 1-seeded and indehiscent. Style simple, slender; stigmas 1 to 3.

1. PLECTRITIS DC.

Annual herbs. Stems simple or rarely with very slender branches. Leaves entire or sparingly toothed, the cauline commonly sessile. Flowers small ($1\frac{1}{2}$ to $2\frac{1}{2}$ lines long), borne in glomerules at the end of the stem or branches, or the glomerules in interrupted or dense spikes. Wings of the fruit commonly incurved and forming a circular hollow or cavity on the side. Species similar in size, habit, leaves and inflorescence. (From Latin *plecto*, to plait or interweave, on account of the involved inflorescence.)

Fruits wingless.....1. *P. samolifolia*.
Fruit conspicuously winged.

Fruit woolly.....2. *P. jepsonii*.

Fruit not woolly.

Fruit wholly glabrous.....3. *P. glabra*.

Fruit more or less hispid.

Cavity of fruit without subulate appendages.

Wings of fruit meeting above, open below; fruit glabrous externally.....4. *P. magna*.

Wings of fruit spreading or incurved; fruit more or less hispid externally.....5. *P. macrocera*.

Cavity of fruit with two stout subulate appendages.....6. *P. daviana*.

1. *P. samolifolia* (DC.) Hoeck. Corolla obscurely bilabiate; spur short; fruit wingless, resembling a buckwheat fruit.

Near the coast northward.

2. *P. jepsonii* (Suksdorf) Davy. Simple, about 10 in. high; leaves spatulate-obovate and narrowed to a winged petiole; upper leaves ovate-lanceolate, sessile, acute; fruit conspicuously covered with woolly hairs; incurved margin of wing thickish, marked lengthwise on the outside by a groove.

Vaca Mts., *Jepson*.

3. *P. glabra* Jepson. About 1 ft. high, the leaf axils bearing some slender branches; leaves ovate, acute or the lower broadly oblong, all more or less erose or with some few serrulations; spur of corolla broad, almost as broad as the throat; fruit wholly glabrous; margins of the fruit thickish, spreading or equally incurved.

Antioch, *Davy*.

4. *P. magna* (Greene) Suksdorf. Stems stoutish, often 2 to 2½ ft. high, the remote nodes with 1 or 2 very slender branches; leaves oblong-obovate, obtuse, 1 to 2¼ in. long, the uppermost smaller, ovate and often acute; "corolla white, its spur short and thick;" fruit smooth and somewhat flattened laterally or narrow dorsally, glabrous outside or the margins of the wings ciliate, the cavity with a hispid line; wings with thin margins, not lobed at apex, incurved, meeting above and leaving a small circular opening below, or closed below and open above.

North Coast Ranges: Vaca Mts.; Napa Range; Knights Valley.

5. *P. macrocera* T. & G. Slender, mostly simple, 3 or 4 to 8 in. high; leaves linear or narrowly oblong; spur of corolla longer than tube; fruit more or less hispid, dorsally carinate, the carina 2-grooved; lateral wings broad, each with a more or less obvious lobe at apex, spreading or incurved.

Napa Range and elsewhere. Var. *CILIOSA* Jepson. Carina of fruit ribbon-like, bordered on each side with a rather dense row of short equal bristles perpendicular to it.—Marin Co.

6. *P. davyana* Jepson. Simple, about 1 ft. high; leaves mostly narrowly oblong; flowers in a dense and mostly uninterrupted spike; spur of corolla much shorter than throat; fruit with broadish back, more or less hispid, the carina bordered with many hispid hairs; wings not lobed at apex, incurved, and merging gradually into the beak; cavity of fruit with a small depression on each side from which arises a single stout subulate body.

Antioch, *Davy*.

VALERIANA SYLVATICA Banks. Perennial; stems erect, simple, from rootstocks; radical leaves mainly undivided, obovate; cauline leaves pinnate or pinnately divided, with 3 to 11 or 13 leaflets; calyx-limb of 5 to 15 bristle-shaped calyx-lobes which are coiled up and inconspicuous until the fruiting stage when they unroll and form a conspicuous plumose and pappus-like crown to the fruit.—High Sierra Nevada.

DIPSACEAE. TEASEL FAMILY.

Herbs with opposite leaves. Flowers in dense heads or short spikes surrounded by an involucre. Calyx-tube adnate to the ovary, its limb cup-shaped or divided into bristles. Corolla borne on the calyx-limb, with 4 or 5-lobed limb. Stamens 4 (or 2 by abortion), inserted on the throat of the corolla; filaments exserted. Ovary 1-celled; style filiform; ovule 1. Fruit an achene, crowned with the persistent calyx.

Bracts of the spike or head conspicuous, rigid, prickly-pointed, exceeding the flowers....

1. *DIPSACUS*.

Bracts of the head herbaceous, inconspicuous, concealed among the flowers....2. *SCABIOSA*.

1. *DIPSACUS* L.

Stout coarse and prickly biennial herbs. Cauline leaves united at base. Flowers pinkish white, in a dense oblong head or short spike, surrounded by an involucre of elongated bracts much surpassing the pointed bracts subtending the flowers. Bracts in fruit very rigid and spine-like. Calyx-limb cup-shaped, 4-toothed. Corolla 4-lobed. Achene surrounded by a 4 to 8-ribbed involucre. (Greek name of the Teasel.)

1. *D. fullonum* L. FULLER'S TEASEL. Erect, 4 or 5 ft. high; radical leaves broadly oblong, arcuate, 1¼ ft. long or less; upper cauline connate-per-

foliate; spikes 3 or 4 in. long; bracts of the involuere narrowly linear, tapering to the acute apex, 1 to 4 in. long; bracts of the spike with recurved tips.

Abundant in low and waste lands about San Francisco Bay: Berkeley; Alameda; San Jose; Marin Co. *D. SYLVESTRIS* Huds., Common Teasel, has been reported at San Francisco; the bracts of its spikes have straight tips.

2. SCABIOSA L.

Large herbs with opposite leaves and the flowers in hemispherical heads on long peduncles. Involuere of many distinct bracts. Involuere cylindrical, not lobed. Calyx-tube adnate to the ovary, produced slightly beyond it and bearing 5 long slender awns. Corolla inserted on the summit of the calyx-tube, slender-funnelform or salverform, with 5 short equal lobes, the marginal ones very much larger with the upper lobes much smaller than the lower. (Latin *scabiosa*, meaning scurfy, the plant used for affections of the skin.)

1. *S. atropurpurea* L. MOURNING BRIDE. Stems branching, 2 or 3 ft. high; lowest leaves lyrate; upper leaves pinnately divided or the uppermost oblong-lanceolate and coarsely serrate or the narrower ones disposed to be entire; peduncles 8 to 12 in. long; heads $1\frac{1}{2}$ in. broad; flower black-purple to pinkish white, the regular corollas 5 or 6 lines long; calyx-awns 3 lines long; fruit an achene, enclosed in the persistent involuere and bearing the exserted calyx-awns.

Native of Europe, naturalized by waysides: Berkeley; Solano Co., etc.

CAMPANULACEAE. BELL-FLOWER FAMILY.

Slender or small herbs with milky juice, alternate simple leaves and regular complete flowers. Calyx-tube adnate to the ovary, the limb commonly 5-parted, usually divided down to the ovary and persistent. Corolla 5-lobed or -parted, inserted with the 5 stamens where the calyx becomes free from the ovary. Ovary 2 to 5-celled; style 1, long, with 2 to 5 stigmas. Fruit a many-seeded capsule.

Capsule dehiscent on the side.

Opening by small valves or circular perforations.

Corolla more or less campanulate; ovary short and broad.....1. CAMPANULA.

Corolla rotate; ovary somewhat elongated.....2. SPECULARIA.

Opening by irregular fissures; ovary short and broad.....3. HETEROCODON.

Capsule dehiscent at the apex within the calyx; ovary club-shaped.....4. GITHOPSIS.

1. CAMPANULA L. BELL-FLOWER.

Herbs with blue flowers. Calyx with 5 narrow lobes, its tube short and broad. Corolla campanulate or nearly so. Filaments dilated at base. Stigmas and cells of the ovary 3 to 5. Capsule short, opening on the side by 3 to 5 small valve-like perforations. (Diminutive of Latin *campana*, a bell.)

Perennials; style filiform, long-exserted; capsule openings near the middle or base.

Style exceeding the campanulate corolla.....1. *C. linnaeifolia*.

Style shorter than the narrowly campanulate corolla.

Leaves sessile; corolla-lobes narrowly lanceolate.....2. *C. prenanthoides*.

Leaves petioled; corolla lobes ovate-oblong.....3. *C. scouleri*.

Annuals; style included in the corolla; capsule urn-shaped, the openings just above the middle.....4. *C. exigua*.

1. *C. linnaeifolia* Gray. Stem about 1 ft. high, slender, simple or sparingly branched at summit; leaves ovate-oblong, crenulate except at base, sessile or subsessile, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the margins retrorsely scabrous, as also the angles of the stem; flowers few, solitary, the peduncles as long or much longer; calyx-lobes lanceolate; corolla pale blue, $1\frac{1}{2}$ in. long; capsule globular.

Swampy places: Pt. Reyes and northward to Mendocino Co. June-July.

2. **C. prenanthoides** Durand. CALIFORNIA HARE-BELL. Stem slender, erect, $1\frac{1}{2}$ to 2 ft. high, often much branched; herbage minutely rough-puberulent or almost glabrous; leaves oblong-ovate or lanceolate, sessile, 1 in. long or less, sharply serrate; flowers mostly in clusters on short pedicels; clusters axillary, or the upper leaves reduced and the inflorescence racemose; corolla cylindrical in the bud, 4 or 5 lines long, 2 or 3 times the length of the subulate calyx-lobes, parted into linear-lanceolate lobes; capsule hemispherical or short-turbinate.

Wooded hills near the coast from Monterey northward; Sierra Nevada from Placer Co. to Mt. Shasta. July.

3. **C. scouleri** Hook. Stem slender, erect, or decumbent at base, mostly simple, 6 to 12 in. high; herbage glabrous; leaves ovate to lanceolate, sharply serrate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, tapering at base into a margined petiole; flowers on filiform peduncles, solitary in the axils or terminal, or the upper leaves reduced to minute bracts and the inflorescence paniculate; corolla exceeding or twice as long as the subulate calyx-lobes, deeply cleft into ovate-oblong lobes.

Redwood region from Marin Co. northward to Washington.

4. **C. exigua** Rattan. Branching from the base and diffuse, 2 to 4 (or 6) in. high, short-hispid, especially at base; leaves obovate, linear, or the uppermost subulate; flowers erect, lateral or terminal on the branchlets, of two kinds, one with slender and rather short style having 3 revolute stigmas at apex and with the dilated bases of the filaments not ciliolate; the other kind with the style longer, conspicuously club-shaped and merely notched at apex, the dilated bases of the filaments ciliolate; corolla of both kinds light blue, 2 to 4 lines long; calyx-lobes subulate-linear, nearly twice the length of the turbinate tube; capsule somewhat urn-shaped, with 3 valve-like openings just above the middle.

Coast Range peaks and ridges: Mt. Hamilton; Mt. Diablo; Mt. Tamalpais; Mt. St. Helena.

2. SPECULARIA Heister. VENUS LOOKING-GLASS.

Annuals with leafy erect stems. Flowers solitary or in pairs, in the axils of the leaves, blue or purplish, 1 or 2-bracteolate. Our species with two kinds of flowers: the earlier fertilized in the bud, with undeveloped corolla and 3 or 4 calyx-lobes; the later with a conspicuous blue corolla and 5-lobed calyx. Corolla rotate or nearly so. Stigmas and cells of the ovary 3, sometimes 2 or 4. Capsule rather long, prismatic or cylindric, dehiscient by small valve-like openings on the sides. (Latin speculum, a looking-glass.)

1. **S. biflora** (R. & P.) Gray. Stems slender, simple or with many branches from the base, 8 to 15 in. high, retrorsely scabrous-hispidulous on the angles; internodes rather short; leaves ovate, mucronate, sessile, entire, or somewhat crenate, 3 to 6 (or the lowermost 8 or 9) lines long; corolla blue, exceeding the linear-lanceolate calyx-lobes; capsule 3 or 4 lines long, sessile.

Low open hills of the Coast Ranges or fields of the interior valleys. Apr.-May.

3. HETEROCODON Nutt.

Delicate annual with solitary axillary flowers of two kinds as in *Specularia*. Calyx-lobes of the earlier flowers 3 or 4, of the later 5 (when 4 or 5 one or two smaller), all foliaceous and much longer than the obpyramidal tube.

Corolla open-campanulate. Capsule short and broad, 3-celled, 3-angled, bursting by mostly irregular lengthwise fissures in the thin spaces between the ribs. (Greek heteros, different, and kodon, bell, the flowers campanulate and of two different kinds.)

1. *H. rariflorum* Nutt. Stems filiform, $1\frac{1}{2}$ to 9 in. high; leaves roundish, $1\frac{1}{2}$ to 5 lines long, sessile, truncate or subcordate at base, sharply toothed, the teeth bristle-pointed and the margin between the teeth frequently ciliate-bristly; calyx sparsely hispid, its lobes ovate, sparingly toothed, 1 to 3 lines long; corolla of earlier flowers scarcely evident, of the later flowers well developed, light blue (the short lobes darker), with the tube $1\frac{1}{2}$ to 2 lines long.

Coast Ranges (Berkeley, Napa Valley, Lake Co. and northward); Sierra Nevada; Southern California. Apr., or as late as July in the higher mountains.

4. GITHOPSIS Nutt.

Small annuals with blue flowers terminating the stems or branches. Calyx-tube euncate, strongly 10-ribbed, adnate up to the summit of the ovary, with 5 linear foliaceous lobes. Corolla tubular-campanulate. Filaments short, dilated at the base; anthers long and linear. Ovary 3-celled; stigma 3-lobed. Capsule coriaceous, crowned with rigid calyx-lobes of its own length, strongly striate-ribbed, many-seeded, dehiscing at apex by a perforation at the place where the style falls away. (Name from Githago, the calyx resembling that of the Corn-Cockle.)

1. *G. specularioides* Nutt. Stems simple or with 1 or several proliferous branches, these in turn sometimes proliferous, 4 to 7 in. high; herbage retrorse-ly rough-pubescent or glabrous; upper leaves oblong, or narrower, 3 to 5 lines long, the lowermost obovate, 1 or 2 lines long, all sharply few-toothed; calyx-lobes 3 to 8 lines long, eventually callous-ribbed, shorter than or 3 or 4 times as long as the corolla; corolla-lobes shorter than the tube; capsule rigid, tapering into a short and stout peduncle.

Open ground in the hill country of the Coast Ranges (Hupa Valley, Round Valley, Napa Valley, Sonoma, Jolon); Sierra Nevada. The var. *DIFFUSA* Jepson is nearly glabrous; sinuses of the calyx hispidulous.—Vaca Mts.; Southern California.

LOBELIACEAE. LOBELIA FAMILY.

Annual herbs with alternate simple entire leaves. Flowers in racemes, complete. Calyx-tube adnate to the ovary, its free border with 5 distinct lobes or teeth. Corolla epigynous, bilabiate, 2 lobes in the upper lip and 3 in the lower. Stamens 5, inserted with the corolla, but generally free from it and alternate with its lobes; anthers and filaments usually united into a tube about the style. Ovary 2-celled; style 1; stigma capitate and girt with a rim of hairs. Juice mostly milky and acrid. Fruit in ours a many-seeded 1 or 2-celled capsule.

Stems erect or ascending; corolla conspicuously bilabiate; capsule commonly 1 to 2 in. long 1. DOWNINGIA.
Stems procumbent; corolla-segments only slightly unequal; capsule $\frac{1}{2}$ in. long..... 2. HOWELLIA.

1. DOWNINGIA Torr.

Dwarf herbs of low plains, margins of vernal pools or in "hog wallows," sometimes in the mountains or in saline marshes. Calyx-tube (adnate to the ovary) very long and stalk-like. Corolla with a short tube and ample bilabiate limb; lips spreading, the larger 3-lobed, the smaller 2-cleft with narrow divisions. Ovary 2-celled, becoming a 1-celled capsule with 2 parietal filiform

placentae. Capsule long and linear, crowned with the persistent calyx-lobes, dehiscent below the apex by 1 to 3 long fissures. (A. J. Downing, an American horticulturist.)

The discrimination of the species as here listed depends to a large degree on color marks. *D. pulchella* is taken as the type of the second group of species (nos. 2 to 6), with two diverging lines of variation, one reaching towards *B. concolor* with disappearance of yellow in the corolla; the other extending to *B. ornatissima* through *B. bicornuta* (not within our limits) and ending in *B. humilis*.

Anther-tube much incurved, nearly hook-shaped1. *D. elegans*.
Anther-tube straight or only slightly curved.

Corolla conspicuously bilabiate.

Lower lip with a central maroon spot2. *D. concolor*.
Lower lip with a central yellow spot.

Tube shorter than calyx-lobes3. *D. pulchella*.

Tube much longer than calyx-lobes4. *D. cuspidata*.

Corolla small and pale5. *D. ornatissima*.

Corolla obscurely bilabiate, the lobes similar6. *D. humilis*.

1. *D. elegans* (Dougl.) Torr. Commonly simple, 4 to 7 in. high; leaves oblong to oblong-lanceolate, $\frac{1}{2}$ in. long; corolla-tube campanulate; the upper lip cut $\frac{2}{3}$ the way down, the segments ascending and parallel; lower lip 3-lobed at apex, the lobes and lateral parts of the body sky blue marked with darker veinlets, main portion white and bearing 2 oblong parallel green or greenish yellow spots; side of throat next to lower lip frequently with purple spots and yellow lines; stamen-column long-exserted, about equaling the upper segments.—(*Bolelia elegans* Greene. *B. insignis* Greene.)

Beds of vernal pools (where water has recently stood), on the plains of the Sacramento Valley. May. Lower lip somewhat concave.

2. *D. concolor* Greene. Branched from the base and somewhat tufted or nearly simple, 4 to 5 in. high, minutely puberulent; corolla light blue; base of lower lip or all of it below the lobes or divided part with a well-defined spot or area of dark maroon; upper lip cleft to the middle only; lobes of lower lip slightly unequal; stamen-column little exserted.—(*Bolelia concolor* Greene.)

Low fields near Suisun. May-June.

Var. *tricolor* Jepson, n. comb. Lower lip with the transverse somewhat quadrate spot of dark maroon bordered by white, this color sometimes extending to the bases of the violet lobes; throat often with yellow folds.—Suisun. Varying into the next. (*Bolelia concolor* var. *tricolor* Jepson.)

3. *D. pulchella* (Lindl.) Torr. Erect or ascending, 2 to 10 in. high, usually simple; leaves oblong-ovate or narrower, $\frac{1}{2}$ in. long; lower lip of corolla cleft into 3 roundish apiculate lobes; upper lip deeply 2-cleft, the oblong-lanceolate lobes divergent and spreading; corolla deep blue, the center of the lower lip yellow with a white border, this somewhat irregular in outline but sharply defined against the blue; side of throat next to the lower lip with three dark violet spots either side of and in the interval between a pair of narrow yellow folds or lines which join the yellow field; corolla-tube 1 line long, the limb ample, 6 lines broad and 4 lines deep, the lower lip plane and at a right angle to the tube; stamen-column nearly or quite equaling the lobes of the upper lip.—(*Bolelia pulchella* Greene.)

The most common and most beautiful species: plains of the lower Sacramento in Solano Co.; abundant and of rank growth in salt marshes near Alvarado; low places in the Gilroy Valley. May-June.

4. *D. cuspidata* Greene. Stems very slender and leaves scarcely exceeding 1 line; flowers few; lower lip of the corolla broadly trefoil-shaped, broader than long; lobes broadly ovate, retuse or somewhat obovate, cuspidately pointed, the terminal half violet, the lower portion white; undivided part of lower lip yellow, plane or nearly so, that is, without protuberances or folds; lobes of the upper lip $1\frac{1}{2}$ lines long, spatulate-obovate, cuspidately acute, slightly divergent, deep violet; anther-tube scarcely exerted from the comparatively long ($1\frac{1}{2}$ lines) and narrow corolla-tube.—(*Bolelia cuspidata* Greene.)

North Coast Ranges: Los Guillicos and Napa valleys. May-June.

5. *D. ornatissima* Greene. Erect, slender, 2 to 6 in. high, simple or branched from the base; tube of corolla raised into a protuberance at base of upper lip, the segments of which are coiled backward into a ring; basal portion of lower lip with 4 short folds, the center white with greenish yellow spots, the lobes blue, all the colors very pale; stamen-column exerted beyond the tube.—(*Bolelia ornatissima* Greene.)

Plains of the lower Sacramento in Solano Co. May. This is doubtless a reduced form of *D. bicornuta* Gray while the next is a still further reduction.

6. *D. humilis* Greene. Very dwarf, 1 in. high; calyx-segments unequal; corolla minute, white, 1 line long, obscurely bilabiate, the ovate-oblong acute segments not very unlike.—(*Bolelia humilis* Greene.)

Sonoma Co.

2. HOWELLIA Gray.

Either aquatic or of muddy margins of pools. Flowers more or less cleistogamous. Calyx-tube united for its whole length to the ovary, the limb with slender segments. Corolla not surpassing the calyx, its very short tube divided nearly to the base on the (apparently) upper side; lobes oblong, nearly equal, three united higher. Ovary 1-celled, the filiform parietal placentae each with 3 to 5 ovules. Capsule membranaceous, bursting irregularly on one side. (Thos. Howell of Portland, author of a pioneer flora of Oregon, Washington and Idaho.)

1. *H. limosa* Greene. Weak and procumbent, the branches 1 ft. long, sometimes matted; leaves lanceolate, sessile, entire, 1 in. long; flowers cleistogamous; capsule clavate-oblong, $\frac{1}{2}$ in. long, crowned by the 5 triangular calyx-teeth.

Muddy shores: Suisun. May. This may be simply a terrestrial form of *H. aquatilis* Gray.

COMPOSITAE. SUNFLOWER FAMILY.

Annual or perennial herbs or shrubs with alternate or opposite leaves. Flowers perfect, unisexual or sterile, in heads, borne on the enlarged summit of the peduncle (receptacle) and surrounded by the bracts of the involucre. Receptacle with bracts subtending the flowers, or with bristles among the flowers, or without bracts or bristles (naked). Corollas tubular and 5-toothed or -lobed, or the limb strap-shaped (or ligulate) and toothed at apex, those of a head all tubular or all ligulate or of both kinds. When both kinds are present the flowers with the ligulate corollas occupy the margin of the head and are called ray-flowers, and the ligulate corollas, rays; the flowers with the tubular corollas occupy the center and are called disk-flowers. Ray-flowers commonly pistillate, sometimes perfect or neutral; disk-flowers commonly

perfect, often staminate or pistillate. Heads with both ray- and disk-flowers are called radiate; with disk-flowers only, discoid. Calyx-tube united with the ovary, the limb when present called a pappus and greatly varied in structure, consisting of awns, hairs, bristles, scales or paleae, or in many cases appearing as a mere crown or ring or wholly obsolete. Stamens 5; filaments free; anthers united and forming a tube, or nearly or quite free in the tribe of Ambrosieae. Style divided above into 2 long branches which bear stigmatic lines on the inside. Ovary 1-celled, 1-ovuled, maturing into an achene, crowned by the pappus when that is present. Pappus commonly persistent and assisting in the dispersion of the 1-seeded fruit.

KEY TO THE TRIBES.

- Heads composed wholly of perfect flowers with ligulate corollas; ligule 5-toothed at apex; herbs with milky juice; leaves alternate or radical1. CICHORIEAE.
 Heads composed of ray- and of disk-flowers or of disk-flowers only.
Receptacle covered with bristles; heads large; flowers conspicuous; corollas cleft into long narrow lobes; rays none; very spiny thistles or thistle-like plants; leaves alternate2. CYNAREAE.
Receptacle with chaffy bracts (see also nos. 28 and 29).
 Rays always present, conspicuous or inconspicuous; disk-flowers perfect; bracts of the involucre foliaceous or herbaceous, not scarious; pappus of paleae or awns, never capillary.
 Involucre of 1 series of equal bracts, each embracing or enfolding a ray-achene; bracts of receptacle often in a single series between ray and disk; leaves alternate or opposite; (annuals except two).....6. MADIEAE.
 Involucre of 1 to several series of bracts, none enfolding ray-achenes; receptacle very chaffy; leaves mostly opposite or radical7. HELIANTHEAE.
 Rays none; leaves alternate (except no. 69).
 Heads unisexual (except no. 63), small, greenish or white; corolla of pistillate flowers none or a rudiment; anthers nearly or quite distinct; pappus none; fruit usually a bur; leaves alternate (the lower opposite in no. 63).....8. AMBROSIEAE.
 Heads composed of both pistillate and staminate (or perfect) flowers; corolla of pistillate flowers filiform; bracts of the involucre few or none; leaves alternate (except no. 69); white-woolly annuals9. INULEAE.
Receptacle naked (without bristles or chaffy bracts, except nos. 28 and 29); leaves alternate (except nos. 26, 36, 37, 38, and 91).
 Bracts of involucre in 1 or 2 series; pappus of soft capillary bristles; both disk- and ray-flowers yellow (except no. 23).....3. SENECEONEAE.
 Bracts of involucre imbricated, dry and scarious; pappus none or reduced to a mere crown or ring; flowers white, yellow or greenish; rays present or absent; leaves usually much divided4. ANTHEMIDEAE.
 Bracts of involucre in few series, little imbricated; pappus paleaceous, awn-like, bristly or none; flowers yellow; rays present (except in no. 42)5. HELENIEAE.
 Bracts of the involucre many and imbricated, often dry or scarious; pappus of capillary bristles; rays none; pistillate corollas mostly filiform; (pappus none and bracts few in no. 75)9. INULEAE.
 Bracts of involucre well imbricated; disk-flowers commonly yellow, the rays of the same or different color or none; pappus of awns or bristles (or of short scales in no. 76)10. ASTEREEAE.
 Bracts of the involucre equal or imbricated; flowers perfect, white or whitish; rays none11. EUPATORIEAE.

TRIBE 1. Cichorieae. CHICORY TRIBE.

Herbs with milky juice and alternate or radical leaves. Receptacle naked or with chaff-like bracts. Flowers all perfect and all with ligulate corolla, the ligule 5-toothed at apex. Anthers sagittate or auricled at base, commonly appendaged at summit. Style-branches stigmatic on their inner side for their whole length.

A. Pappus paleaceous or of rigid bristles.

Pappus paleaceous, the paleae without awns; achenes neither ribbed nor beaked.

- Flowers blue; receptacle naked; herbage soft1. CICHORIUM.

Flowers yellow; receptacle with chaff-like bracts; thistle-like plant.....2. *SCOLYMUS*.
Pappus consisting of bristles, the bristles (or some of them) plumose.

Receptacle naked.

Achenes not beaked nor ribbed; tall annuals, paniculately branching above.....
3. *STEPHANOMERIA*.

Achenes (at least the inner) with a slender beak.

Flowers yellow; achenes 5 to 10-ribbed; low branching thistle-like biennial.....
4. *PICRIS*.

Flowers purple; achenes ribbed; perennial or biennial with grass-like leaves.....
5. *TRAGOPOGON*.

Flowers white; achenes obscurely ribbed; stem branching above; annual.....
6. *RAFINESQUIA*.

Receptacle with chaff-like bracts; at least the inner achenes beaked; flowers yellow;
stems naked; leaves radical7. *HYPOCHAERIS*.

Pappus paleaceous, the paleaceous portion short or often very long, tipped with a long
or short bristle or awn which is either naked or barbellate, or rarely subplumose;
achenes not beaked.

Ligules short, the head in anthesis small; bracts of the involucre equal but with
shorter ones at base, all membranous; pappus-bristles 5.

Paleae of the pappus elongated, cleft at tip, the short bristle or awn proceeding from
the cleft; peduncle enlarged at summit; heads erect.....8. *UROPAPPUS*.

Paleae of the pappus mostly short, abruptly or gradually passing into the awn;
peduncles not enlarged at summit; heads nodding in the bud9. *MICROSERIS*.

Ligules elongated, the heads in anthesis showy; bracts of the involucre imbricated in
several series; pappus-bristles 10 or more, barbellate or subplumose, the paleaceous
base short and firm10. *SCORZONELLA*.

*B. Pappus of fine soft capillary bristles, scabrous but never plumose; achenes ribbed
or nerved.*

Achenes not flattened; receptacle naked, or bristly in some species of no. 11.

Achenes beakless; stems commonly branching or the plants acaulescent.

Pappus mostly soft and deciduous; achenes terete, truncate.....11. *MALACOTHRIX*.

Pappus dull white or tawny; achenes linear.....12. *HIERACIUM*.

Pappus white; achenes columnar or fusiform13. *CREPIS*.

Achenes with a slender beak; acaulescent plants, the peduncles 1-flowered..14. *AGOSERIS*.

Achenes flattened; receptacle naked; leafy-stemmed plants.

Achenes beaked; heads in a panicle15. *LACTUCA*.

Achenes not beaked; heads corymbed or umbellate16. *SONCHUS*.

TRIBE 2. *Cynareae*. THISTLE TRIBE.

Thistles or thistle-like herbs with alternate prickly leaves. Heads large.
Bracts of the involucre imbricated, usually prolonged into a spine or bristle,
or provided with a membranous edge. Receptacle bristly or hairy. Flowers all
perfect. Rays none. Corollas tubular, cleft into long narrow lobes. Anthers
long-tailed at the base, with elongated appendages at the tip. Pappus bristly
or plumose, rarely paleaceous.

A. Achenes obliquely or somewhat laterally inserted on the receptacle.

Heads not leafy-involucrate; pappus-bristles or -scales in 2 or 3 rows or none.....
17. *CENTAUREA*.

Heads leafy-involucrate; pappus-awns in 2 series18. *CNICUS*.

B. Achenes inserted on the receptacle by their very base.

Filaments distinct.

Pappus paleaceous and double (in 2 different sets)19. *CARTHAMUS*.

Pappus of plumose bristles, united at base and deciduous in a ring.

Bristles of the pappus in several series; achenes somewhat 4-angled.....20. *CYNARA*.

Bristles of the pappus in a single series; achenes not angled21. *CIRSIUM*.

Filaments united below; pappus of narrow barbellate paleae22. *SILYBUM*.

TRIBE 3. *Senecioneae*. GROUNDSEL TRIBE.

Herbs, or two species suffrutescent. Leaves alternate or radical. Bracts
of the involucre little or not at all imbricated, mostly in 1 or 2 rows. Recep-
tacle naked. Flowers of both disk and ray yellow, except *Petasites*. An-
thers not caudate. Pappus-bristles soft, commonly copious, most often white.

A. Radical leaves broad, palmately cleft or parted.

- Cauline leaves scale-like; flowers subdioecious, whitish; pistillate corollas distinctly ligulate 23. PETASITES.
 Cauline leaves similar to the radical; flowers all perfect and fertile, yellow; rays none.... 24. CACALIOPSIS.

B. Leaves not palmately parted; flowers yellow.

- Bracts of the involucre linear, rigid; heads rayless; leaves entire, sessile, white-woolly beneath 25. LUINA.
 Bracts of the involucre thin-herbaceous; heads radiate or rayless; leaves various.
 Leaves chiefly opposite; heads large 26. ARNICA.
 Leaves alternate; heads large or small 27. SENECIO.

TRIBE 4. Anthemideae. MAYWEED TRIBE.

Strong-scented or aromatic plants. Leaves alternate, all or some of them finely dissected, pinnately parted or pinnatifid, except one species. Bracts of the involucre imbricated, commonly dry and scarious or with scarious margins. Receptacle naked or with chaff-like bracts. Flowers white, yellow or greenish. Rays present or none. Anthers not caudate. Pappus none or a short scarious crown.

A. Receptacle with chaff-like bracts.

- Heads solitary, terminating leafy branches or peduncles; rays 14 to 20; annual..... 28. ANTHEMIS.
 Heads in a terminal corymb; rays 4 or 5; perennial 29. ACHILLEA.

B. Receptacle naked.

- All of the flowers with a corolla.
 Heads solitary, terminating leafy branches or peduncles.
 Rays many, conspicuous..... 30. CHRYSANTHEMUM.
 Rays none; flowers all alike, perfect, greenish; annual 31. MATRICARIA.
 Heads corymbose; rays none; flowers yellow; perennial 32. TANACETUM.
 Heads in paniced racemes or spikes, small; rays none; flowers yellow or purplish; shrubs or herbs 33. ARTEMISIA.
 Marginal flowers without a corolla; heads discoid.
 Heads peduncled; mature achenes borne on pedicels; style deciduous..... 34. COTULA.
 Heads sessile; achenes pointed with the spine-like persistent style 35. SOLIVA.

TRIBE 5. Helenieae. SNEEZEWEED TRIBE.

Herbs or some Eriophyllums suffruticose. Leaves alternate or opposite. Flowers in our species yellow. Rays present in all our species except Chaenactis. Anthers not caudate. Receptacle naked. Bracts of the involucre in 1 or 2, sometimes in 3 or 4 (?) series. Pappus of paleae, awns or bristles, or often wanting.

A. Leaves opposite; herbage glabrous, pubescent or slightly tomentose, never white-woolly.

- Bracts of the involucre imbricated, in more than 1 series; pappus none; succulent perennial 36. JAUMEA.
 Bracts of the involucre in a single series and
 United into a toothed cup; pappus paleaceous or none; annuals 37. LASTHENIA.
 Distinct; pappus of paleae or bristles, or both, or none; annuals except one... 38. BAERIA.

B. Leaves alternate; herbage glabrous or in several genera white-woolly.

- Ray-corollas with a toothed appendage at base opposite the ligule; pappus none; leaves entire or denticulate; annuals 39. MONOLOPIA.
 Ray-corollas without appendage at base.

*Pappus present.**Bracts of the involucre erect.*

- Rays conspicuous; paleae firm, blunt; leaves divided or incised; perennial herbs or suffruticose plants 40. ERIOPHYLLUM.
 Rays very inconspicuous; paleae subulate; leaves narrowly linear and entire; slender annuals 41. RIGIOPAPPUS.
 Rays none or the marginal corollas palmately enlarged; leaves divided; annuals... 42. CHAENACTIS.

- Bracts of the involucre reflexed; rays usually drooping; paleae short-pointed; leaves often decurrent; perennial herbs 43. HELENIUM.

- Pappus none; leaves pinnately parted; low annual 44. BLENNOSPERMA.

TRIBE 6. *Madieae*. TARWEED TRIBE.

Ours annuals (except one species of no. 45 and no. 54). Herbage glandular, viscid or heavy-scented (except nos. 53, 54, and 55). Leaves alternate or opposite. Bracts of the involucre in a single series, each partly or completely enclosing an achene. Bracts of the receptacle commonly in a single series between disk- and ray-flowers and often united into a cup, or sometimes scattered among the disk-flowers. Rays always present, showy or inconspicuous. Anthers not caudate. Ray-achenes always fertile, without pappus (except nos. 51 and 54); disk-achenes fertile or sterile, their pappus paleaceous, awn-like or none.

A. Ray-achenes laterally compressed, completely enfolded by the deeply sulcate bracts of the involucre which are strongly carinate on the back.

Rays showy or inconspicuous; disk-flowers few to many; mostly tall plants.....45. *MADIA*.
Rays inconspicuous; disk-flowers one; low slender plants46. *HARPAECARPUS*.

B. Ray-achenes turgid or somewhat obcompressed, half enclosed by the bracts of the involucre which are rounded on the back.

Achenes of ray without pappus.

Rays 5 to 40, 2 or 3-lobed or -toothed; disk-achenes with or without pappus; leaves, at least at base, not entire.

Leaves not spiny, commonly viscid and glandular.

Receptacle flat; rays 5 to 25, always (?) 3-lobed; bracts of involucre and of receptacle at length deciduous47. *HEMIZONIA*.

Receptacle convex; rays about 15, 3-lobed; bracts of involucre and of receptacle persistent, the outer beset with clavate processes48. *HOLOCARPUS*.

Leaves (at least the upper) spinose and rigid, little viscid or glandular; rays 25 to 40, 2-lobed; bracts of involucre and of receptacle persistent or deciduous, not beset with processes49. *CENTROMADIA*.

Rays 1 to 5 (or 8), broad and palmately 3-lobed; achenes with paleaceous pappus; leaves all narrowly linear and entire50. *CALYCADENIA*.

Achenes of ray with pappus; disk-achenes with plumose pappus51. *BLEPHARIZONIA*.

C. Ray-achenes obcompressed or clavate, completely enfolded by the bracts of the involucre, which at base have thin margins and flattish backs.

Achenes in fruit not expanding; pappus present or none.

Vernal annuals; rays 8 to 20, commonly showy, yellow, white, or yellow tipped with white52. *LAYIA*.

Summer plants; rays 5, comparatively inconspicuous.

Annuals; heads clustered; bracts of receptacle distinct; rays pale yellow; pappus none53. *LAGOPHYLLA*.

Perennial; heads solitary; bracts of receptacle connate; flowers white or rose-tinged; pappus present54. *HOLOZONIA*.

Achenes in fruit expanding into an open globose head; pappus silvery-scarious, the longer set of paleae longer than the achenes55. *ACHYRACHAENA*.

TRIBE 7. *Heliantheae*. SUNFLOWER TRIBE.

Herbs with mostly opposite or radical leaves. Herbage commonly with balsamic-resinous juice. Rays present, almost always showy. Bracts of the involucre herbaceous or foliaceous, or at least not scarious. Receptacle with chaff-like bracts, each subtending a flower. Anthers not caudate. Pappus paleaceous, of rigid awns, or cup-like, never of capillary bristles. Achenes thick or flattened contrary to the subtending chaffy bract, never parallel with it.

A. Bracts of the involucre in 2 to several series.

Involucre of 2 series of similar bracts; flowers white; leaves opposite56. *ECLIPTA*.
Involucre imbricated, its bracts in several series; flowers yellow.

Ray-flowers maturing achenes; low perennials with broad radical leaves.

Pappus none57. *BALSAMORRHIZA*.

Pappus present58. *WYETHIA*.

Ray-flowers not maturing achenes.

Pappus persistent; achenes thick, not notched at summit; leaves alternate, except the lowest; tall annuals or perennials59. *HELIANTHUS*.

Pappus caducous; achenes compressed, notched at apex; leaves chiefly or all radical; perennial60. *HELANTHELLA*.

B. Bracts of the involucre in 2 dissimilar series ("double"); flowers yellow.

Leaves opposite, simple or pinnately parted; pappus of persistent barbed awns. .61. *BIDENS*.
Leaves chiefly radical, or alternate, dissected into narrowly linear or filiform lobes;
pappus not of barbed awns62. *LEPTOSYNE*.

TRIBE 8. *Ambrosieae*. RAGWEED TRIBE.

Coarse homely weeds with small greenish or white heads. Leaves alternate or the lowest opposite in no. 63. Flowers unisexual, the staminate and the pistillate in separate heads (the staminate heads in a raceme or spike above the pistillate heads, which are few and axillary) or in the same head (heads solitary in the axils). Receptacle of the staminate or of the perfect heads with chaff-like bracts. Rays none. Corolla of pistillate flowers none or a mere rudiment. Anthers distinct or scarcely coherent, not caudate. Pappus none. Fruit commonly a bur.

Heads containing both staminate and pistillate flowers, the latter at the margin; involucre of 4 or 5 rounded united bracts63. *IVA*.

Heads unisexual, both pistillate and staminate on the same plant; involucre of pistillate heads closed and bur-like, only the style-branches exerted; staminate heads in a raceme or spike, their involucre open.

Involucral bracts of the staminate heads united.

Pistillate involucre beaked at apex and armed near the beak with a single row of short prickles64. *AMBROSIA*.

Pistillate involucre with 1 to 4 beaks and armed with several rows of prickles.....
65. *FRANSERIA*.

Involucral bracts of staminate heads distinct; involucre of pistillate heads maturing into a stout bur66. *XANTHIUM*.

TRIBE 9. *Inuleae*. EVERLASTING TRIBE.

Annual or perennial herbs. Herbage mostly white-woolly (except *Pluchea*). Leaves alternate (opposite in *Psilocarphus*), entire, or more or less dentate in *Pluchea* and *Adenocaulon*. Heads small; rays none. Bracts of the involucre frequently white or scarious. Pistillate flowers mostly with filiform corollas. Sterile flowers either perfect or staminate. Anthers caudate at base. Style-branches stigmatic to the unappendaged summit. Pappus capillary or none.

A. Receptacle with bracts (chaffy); involucral bracts few or none; woolly annuals.

Fruit-bearing bracts each enclosing its achene and falling away with it.

Achenes gibbous, the corolla and style borne laterally; pappus none.....67. *MICROFUS*.

Achenes straight or only slightly curved, the corolla and style borne at its apex; pappus none.

Receptacle slender or columnar; leaves alternate68. *STYLOCLINE*.

Receptacle globose; leaves opposite69. *PSILOCARPHUS*.

Fruit-bearing bracts open, merely subtending the achenes, persistent; pappus none.....
70. *EVAX*.

Bracts of 2 kinds, the lower loosely enclosing the pistillate (fertile) flowers, the others chaff-like and surrounding a central cluster of both pistillate and sterile flowers whose achenes bear pappus71. *FILAGO*.

B. Receptacle without bracts (not chaffy); involucral bracts many (except no. 75); perennials or annuals.

Pappus present; achenes naked.

Bracts of the involucre scarious; herbage woolly.

Flowers all fertile, perfect and pistillate in the same head.....72. *GNAPHALIUM*.

Flowers dioecious73. *ANAPHALIS*.

Bracts of the involucre dry but not scarious; herbage not woolly74. *PLUCHEA*.
Pappus none; achenes bearing stipitate glands; leaves broad, woolly beneath.....
75. *ADENOCaulon*.

TRIBE 10. *Astereae*. ASTER TRIBE.

Annual or perennial herbs or shrubs, with bland watery juice, scentless

herbage (the foliage sometimes gummy or resinous) and alternate leaves. Receptacle naked. Bracts of the involucre commonly well imbricated. Disk-flowers yellow (except in some *Lessingias* and *Pentachaetas*), perfect in all ours except *Baccharis*. Rays present or absent. Anthers not caudate at base. Pappus of awns or bristles (except *Bellis*).

A. Flowers of both disk and ray yellow (except in Pentachaeta); rays present (except in no. 83 and one species of nos. 78, 80 and 82).

Pappus of several short scales; heads very small.....76. GUTIERREZIA.

Pappus of several caducous awns or bristles; heads large and very gummy; involucre bracts often squarrose; leaves not narrow, mostly serrate; perennial herbs77. GRINDELIA.

Pappus of persistent bristles.

Bristles 3 to 5 (sometimes obsolete); low annuals with filiform stems and leaves.....78. PENTACHAETA.

Bristles many.

Ray-achenes without pappus or the pappus a reduced crown.....79. HETEROTHECA.

Ray-achenes (when present) with pappus like that of disk.

Pappus often of 2 kinds; the inner capillary, the outer very short and scale-like or obsolete.....80. CHRYSOPSIS.

Pappus of one kind.

Evergreen shrubs.

Heads solitary at the ends of the branches; pappus permanently white.....81. STENOTUS.

Heads in cymose or corymbose clusters; pappus in age reddish.....82. ERICAMERIA.

Suffrutescent or herbaceous plants; heads in corymbs or panicles.

Rays none; corolla throat ventricose.....83. ISOCOMA.

Rays present; corolla not ventricose.....84. SOLIDAGO.

B. Flowers yellow, white, or purple; rays none, but the outer corollas often enlarged and more deeply cleft on the inner side.

Heads small, turbinate or campanulate; pappus present, its bristles commonly numerous and reddish brown in age; annuals.....85. LESSINGIA.

C. Flowers of the disk yellow (sometimes changing to purple); rays never yellow, always present (but so inconspicuous as to appear wanting in one species of Aster and of Erigeron).

Pappus none; heads on scape-like peduncles; rays white or pink-tinged; ours perennial herb86. BELLIS.

Pappus of disk-achenes of numerous capillary bristles.

Pappus reddish or rusty brown; pappus of ray scanty or none; perennial herbs.....87. CORETHROGYNE.

Pappus dull white; pappus of ray similar to disk.

Bracts of the involucre mostly in 2 or more series, usually with herbaceous tips; rays usually numerous; perennial or annual herbs.....88. ASTER.

Bracts of the involucre in 1 or 2 series, without distinctly herbaceous tips; rays very numerous and narrow; perennial or biennial herbs.....89. ERIGERON.

D. Flowers whitish or yellowish, dioecious; rays none.

Ours shrubs except one.....90. BACCHARIS.

TRIBE 11. Eupatorieae. EUPATORY TRIBE.

Ours herbs or suffrutescent plants with white or flesh-colored perfect disk-flowers and no rays. Receptacle naked. Anthers not caudate at base. Style-branches stigmatic only below the middle.

Leaves opposite; pappus of awns and paleae.....91. TRICHOCORONIS.

Leaves alternate; pappus of bristles only.....92. BRICKELLIA.

TRIBE 1. Cichorieae. CHICORY TRIBE.

1. CICHORIUM L.

Perennial herb, the leaves mostly radical, those of the stiff branching stem reduced and bract-like. Flowers blue, in sessile heads. Receptacle without bracts. Bracts of the oblong involucre herbaceous, in 2 series, the outer 4 or

5, somewhat spreading, the inner about 8, erect. Achenes 5-angled, truncate, beakless. Pappus of 2 or 3 series of short blunt paleae. (Altered from the Arabic name.)

1. *C. intybus* L. CHICORY. Stems erect from a deep taproot, 2 to 4 ft. high; radical leaves runcinate-pinnatifid; heads in sessile clusters along the nearly naked branches; flowers rarely white.

Waste fields, escaped from gardens: Berkeley, Oakland, etc. Root used as a substitute for coffee.

2. SCOLYMUS L.

Erect glabrous thistle-like herb. Leaves alternate, rigid, sinuate-dentate or pinnatifid, decurrent, the lobes spinescent. Heads rather large, terminal and lateral, sessile. Flowers yellow. Bracts of the involucre in few rows, scarious-margined and spinescent-tipped, subtended by foliaceous bracts. Receptacle chaffy, the chaff more or less embracing the beakless achenes. Pappus a crown of scarious unequal paleae. (Old Greek name.)

1. *S. hispanicus* L. GOLDEN THISTLE. Native of the Mediterranean Region, naturalized at Los Gatos.

RHAGADIOLUS Juss. Annual herbs with yellow flowers. Bracts of the involucre in a single row, narrow, rigid, incurved, enfolding the marginal achenes, stellately spreading in age, sparingly hispid. Receptacle naked. Achenes 5 to 10-ribbed, the ribs barbellate. Pappus of outer achenes a crown of denticulate or fimbriate scales; pappus of inner achenes double, the inner set consisting of bristles paleaceous-dilated towards the base, the outer set consisting of short scales or none. *R. HEDYNOIS* All. Commonly branched, 2 or 3 ft. high; radical leaves petioled and often lobed, the cauline sessile, entire, serrate, or with a few coarse salient teeth; flowering heads $\frac{1}{2}$ in. in diameter or less, on naked or sparingly leafy peduncles.—European weed reported from Sonoma Co., Mariposa Co. and San Diego.

SCORZONERA L. Heads borne on very long peduncles. Flowers yellow. Bracts imbricated in several series, the outer ovate, the inner lanceolate, all acuminate. Receptacle naked. Achenes many-ribbed, beakless. Pappus-bristles in several series, unequal, serrulate or more or less soft-hairy, some often longer and naked at the apex. *S. HISPANICA* L. Viper's Grass. Perennial herb 2 to 3 ft. high; herbage glabrous and glaucous; leaves oblong, serrulate, tapering to a petiole at base, $1\frac{1}{2}$ ft. long or less; heads in anthesis 2 in. in diameter, nodding in the bud.—Garden plant, native of Europe, cultivated for the sake of its carrot-like roots, spontaneous in Knights Valley and around Calistoga and Ukiah.

3. STEPHANOMERIA Nutt.

Tall and rather slender annual herbs, paniculately branching above. Leaves runcinate, reduced above to herbaceous bracts. Heads small, 3 to 12-flowered. Flowers pink or flesh-color, open in the early morning, the ligules all equal. Involucre cylindrical or rarely campanulate, its inner bracts linear and equal, with some short calyculate outer ones. Receptacle flat, naked. Achenes oblong or short-linear, strongly angled, glabrous, often rugose, truncate at both ends, the broad base hollowed at the insertion. Pappus-bristles white, plumose. (Greek stephane, a wreath, and meros, a division, perhaps referring to the virgate branches.)

1. *S. virgata* Benth. Herbage glabrous; stem rigid, virgate or with virgate branches, 1 to 4 ft. high; upper leaves linear, small and entire; lower oblong or spatulate, often sinuate or pinnatifid; heads 3 to 4 lines long, subsessile

along the naked virgate branches, 4 to 8-flowered; achenes subelavate or oblong, rugose-tuberculate between the ribs; pappus clear white, plumose almost throughout.—(*Ptiloria virgata* Greene.)

Common on open cañon sides and ridges, throughout California. Aug.-Sept.

4. PICRIS L.

Coarse rough-bristly biennial with leafy stems. Heads short-peduncled, terminal or along the branches. Flowers yellow. Receptacle without bracts. Outer bracts of involucre loose and spreading, ovate, bristly-margined and spinescent at tip; inner bracts erect, linear-lanceolate. Achene somewhat flattened, transversely rugose, ours with a long and slender beak and bearing a pappus of densely plumose bristles. (Greek *pikros*, bitter.)

1. *P. echioides* L. BRISTLY OX-TONGUE. Branching, 2 to 3 ft. high; stem hispid with barbed hairs; leaves narrowly oblong or the lower oblanceolate, sessile, rough-hispid; bracts of the outer involucre 5, subcordate at base; inner bracts long-acuminate, bearing just below the tip a pinnatifid bristle or appendage; achenes reddish, the body $1\frac{1}{2}$ lines long, the beak as long or longer; pappus copious, white.

Summer weed, naturalized from Europe: widely and thoroughly established in open fields and waste grounds from southern Napa Co. to Berkeley and Santa Clara Co. Steadily and constantly spreading. *

5. TRAGOPOGON L.

Stout glabrous biennial or perennial herbs, somewhat succulent. Leaves grass-like, entire, clasping. Heads large, long-peduncled, opening in the early morning, usually closed by midday. Flowers in ours purple. Involucre narrowly campanulate. Involucral bracts in 1 series, nearly equal, lanceolate, acuminate, united at the very base. Receptacle naked. Achenes muricate, 5 to 10-ribbed, long-beaked or the outermost beakless. Pappus ample, its bristles long-plumose. (Greek *tragos*, a goat, and *pogon*, a beard.)

1. *T. porrifolius* L. SALSIFY. Stems from a stout taproot, very leafy at base, 2 to 4 ft. high; leaves linear-lanceolate, long-acuminate, 1 ft. long or more; peduncle thickened and hollow below the head; heads in fruit 2 to $2\frac{1}{4}$ in. high; flowers deep purple; achenes cylindric, $\frac{1}{2}$ in. long, the beak nearly twice as long.

Naturalized from Europe at Berkeley, spreading along grassy and less frequented streets. May-June. Root edible, tasting like oysters and so called "Oyster Plant."

6. RAFINESQUIA Nutt.

Stout leafy glabrous branching annuals. Leaves toothed or pinnatifid. Panicle more or less corymbosely branching. Heads 15 to 30-flowered. Involucre in anthesis conical-cylindraceous. Flowers white, the ligules unequal. Receptacle flat, naked. Achenes terete, with a few obscure ribs, tapering into a slender beak, excavated at the insertion, but without callous thickening. Pappus-bristles capillary, 10 to 15, long-plumose from the base to near the tip. (C. S. Rafinesque, 1783-1840, American naturalist, celebrated for his genius and eccentricity.)

1. *R. californica* Nutt. Stem robust, sometimes almost fistulose below, branching above, $1\frac{1}{2}$ to $5\frac{1}{2}$ ft. high; leaves oblong in outline, pinnatifid to denticulate or almost entire, sessile and auriculate-clasping or the lowermost narrowed to a winged petiole, 6 in. long or less, those of the inflorescence

reduced to herbaceous bracts; heads in fruit $\frac{3}{4}$ in. high; main involueral bracts 11 to 15, linear or lanceolate-acuminate, and with some loose subulate ones at base; beak of achene as long as the body; pappus dull white.—(*Nemoseris californica* Greene.)

Shady or moist places in the hill country of the Coast Ranges: Pt. Arena; Oakland Hills; Mt. Diablo; Santa Cruz Mts.; Monterey Co. and southward to Southern California. June.

7. HYPOCHAERIS L.

Herbs. Stems naked, bearing a solitary head or a somewhat corymbose cluster of long-peduncled heads. Flowers yellow. Leaves in a radical cluster or rosette, toothed or pinnatifid. Involucre campanulate or cylindrical, its bracts rather few, lanceolate, imbricated, appressed, the outer ones successively shorter. Receptacle flat, its scarios chaffy bracts thin and narrow. Achenes glabrous, upwardly scabrous, the body 10-ribbed, narrowly oblong or fusiform, all tapering upward into a slender beak, or the outermost truncate. Pappus of plumose bristles, some of the outer often shorter and naked. (Greek name used by Theophrastus for some cichoriaceous plant.)

Annual; outermost achenes truncate at summit.....1. *H. glabra*.
Perennial; achenes all beaked.....2. *H. radicata*.

1. *H. glabra* L. SMOOTH CAT'S-EAR. Glabrous annual; stems several, erect, simple or mostly corymbosely branched, 9 to 18 in. high; leaves broadest above, denticulate, broadly toothed with triangular sinuses, or saliently lobed; heads campanulate; ligules scarcely longer than the involucre; outermost achenes truncate at summit, the others beaked.

Naturalized European weed, not uncommon in cultivated fields and pasture lands from Marin Co. to Sherwood Valley. May-June.

2. *H. radicata* L. HAIRY CAT'S-EAR. Stems several, thickening upward, from a fleshy perennial root; leaves hispid with spreading hairs, pinnatifid below the large terminal lobe into oblong obtuse lobes; rays longer than the involucre, which is disposed to twist slightly after anthesis.

Naturalized European weed, abundant from Humboldt Co. south to Marin Co., occasional at Berkeley. Leafy bulblets or rosettes often form in the axils of the inflorescence, particularly late in the season. June-Aug. Also called Gosmore.

8. UROPAPPUS Nutt.

Nearly acaulescent annuals. Leaves pinnatifid with mostly subulate or acuminate lobes or entire. Peduncles enlarged at summit, naked, each bearing a single head. Heads oblong, erect; ligules short, the heads in anthesis small. Main bracts of the involucre about equal, but with shorter ones at base, all membranous. Achenes 10 to 12-ribbed. Pappus-paleae 5, elongated, tipped with a very short awn or bristle which proceeds from the cleft summit. (Greek *oura*, a tail, and pappos, pappus, on account of the bristle-like appendage to the paleae.)

Pappus clear white, soft, deciduous from the black achenes.....1. *U. linearifolius*.
Pappus dull brown or sordid, of firm texture, persistent on the light colored achenes.
Palea longer than the awn of the pappus.....2. *U. lindleyi*.
Palea much shorter than the awn of the pappus.....3. *U. macrochaetus*.

1. *U. linearifolius* (DC.) Nutt. Stems or peduncles often several from the base, erect, 9 to 18 in. high, in robust plants thickened or fistulose under the oblong head; leaves linear (3 to 6 in. long and 1 to 2 lines wide) and with 2 or 3 to several pairs of more or less remote salient lobes; heads at

maturity (after the achenes have spread) $1\frac{1}{2}$ to $1\frac{3}{4}$ in. broad; achenes attenuate above into a beak, 5 lines long; pappus silvery white, 6 to 7 lines long, the very delicate awn about $\frac{1}{2}$ the length of the deeply notched paleae.—(*Microseris linearifolia* Grav.)

Open ground, low hills or sometimes on higher slopes, throughout California. Apr.-May.

2. *U. lindleyi* (DC.) Nutt. Stout, 10 to 14 in. high, the peduncle scarcely thickened under the head; leaves as in the preceding, but rather broader; achenes brownish, 5 lines long, slightly narrowed toward the summit; pappus dull brown or sordid, 6 to 7 lines long, the awn from a shallow notch and very little shorter than the paleae.—(*Microseris lindleyi* DC.)

Oakland and San Mateo Co., southward to Southern California. Var. *CLEVELANDII* Jepson. Scurfy-puberulent; achenes not at all attenuate; awn less than half as long as the paleae.—Plains east of Mt. Diablo.

3. *U. macrochaetus* (Gray) Greene. One to 2 ft. high; involucre in anthesis narrow, 8 to 10 lines high; achenes 3 to 4 lines long, decidedly attenuate at summit; paleae short, only $\frac{1}{3}$ of the length of the awn, cleft to the middle.—(*Microseris macrochaeta* Gray.)

San Francisco, Bigelow (acc. to Gray), to San Diego. Var. *KELLOGGII* Jepson. Achenes attenuate at each end and the paleae with a shallow notch.—San Bruno Hills and Marin Co.

9. MICROSERIS Don.

Acaulescent annuals, glabrous or only slightly puberulent. Leaves in a radical tuft, pinnatifid with mostly linear and often falcate lobes, or entire. Peduncles scape-like, leafless, one-headed. Heads in anthesis narrowly oblong to ovoid or subglobose, nodding in the bud, mostly erect in fruit. Ligules short. Achenes slender-fusiform or cylindric, ribbed, mostly truncate. Pappus-paleae 5, mostly short, abruptly or gradually passing into the scabrous awn. (Greek micros, small, and seris, lettuce.)

Achenes attenuate toward the apex, the upper half not filled by the seed.....

1. *M. attenuata*.

Achenes tapering slightly from base to summit or even almost turbinate, the whole cell filled by the seed.

Paleae reduced to a triangular base or almost none, the awns fragile and deciduous....

2. *M. aphantocarpa*.

Paleae of the pappus conspicuous, the awns less brittle and more persistent.

Heads less than $\frac{1}{2}$ in. high; achenes little more than 1 line long.....3. *M. elegans*.

Heads more than $\frac{1}{2}$ in. high.

Heads hemispherical in mature fruit, or nearly so; paleae and awns rather sharply defined, the palea $\frac{1}{2}$ to $\frac{3}{4}$ the length of the awn.

Achenes obviously contracted under the summit, the outermost commonly white-villous.....4. *M. douglasii*.

Achenes not contracted under the truncate summit, the outermost sometimes villous.....5. *M. bigelovii*.

Heads turbinate in mature fruit; paleae narrowly lanceolate, tapering into and longer than the awn.....6. *M. acuminata*.

1. *M. attenuata* Greene. Scapes rather few, suberect, 11 to 15 in. high; leaves in the radical cluster few, mostly pinnately parted into narrow linear lobes; involucre $\frac{1}{2}$ in. high, barely calyculate at base; pappus 3 to $3\frac{1}{2}$ lines long, equaling or a trifle longer than the achenes; paleae oblong or ovate, $\frac{1}{2}$ to $\frac{1}{3}$ the length of the awn, externally either lightly or conspicuously villous.

Solano Co. to Alameda Co. Apr.-May.

2. *M. aphantocarpa* Gray. Scapes decumbent at base or wholly erect, 10 to 16 in. high; leaves subentire or pinnatifid; involucre merely calyculate;

achenes slender, 2 to $2\frac{1}{4}$ lines long; pappus-bristles 3 to 4 lines long, not obviously dilated at base, slender, fragile or deciduous.

Contra Costa Co. to Southern California. Var. *TENELLA* Gray. Pappus-bristles commonly but 2 or 3, with a manifestly ovate palea at base.—Napa Valley; lower Sacramento Valley and southward. Occasionally destitute of pappus acc. to Greene. Var. *INDIVISA* Jepson. Scapes strictly erect; leaves oblanceolate, entire, or a few toothed or pinnatifid; outer row of achenes silvery-silky; pappus-bristles 4 to 5 lines long, the paleae triangular.—Plains of Solano Co. Apr.-May.

3. *M. elegans* Greene. Scapes slender, decumbent at base, commonly 4 to 7 in. high; heads in fruit less than $\frac{1}{2}$ in. high; achenes little more than 1 line long, tapering gradually from the summit to the base; paleae of the pappus ovate-deltoid, either obscurely emarginate or more attenuate into a slender awn about 4 times as long, the paleae and the summit of the achene sometimes minutely villous.

Plains of the lower Sacramento Valley to Contra Costa Co. and Southern California.

4. *M. douglasii* Gray. Scapes 8 to 17 in. high; leaves in the rosulate radical cluster many, pinnatifid; heads broadly ovoid, or in age hemispherical, 9 to 10 lines high; achenes oblong-turbinate, thickish, obviously contracted under the summit, nearly $2\frac{1}{2}$ lines long, the outermost usually white-villous; paleae of the pappus ovate to orbicular, 2 lines long and nearly as broad, scarious, commonly imbricated or convolutely overlapping, abruptly acute or retuse at the apex, $\frac{1}{2}$ to $\frac{3}{4}$ as long as the awn, glabrous or villous externally.

Common from Solano Co. and Napa Valley to Berkeley and southward. Apr.-May. Specimens from the Montezuma Hills show central achenes with only 1 or 2 paleaceous awns.

5. *M. bigelovii* Gray. Often 1 ft. high or more; leaves entire or pinnatifid; heads broadly ovate, $\frac{1}{2}$ in. high; involucre disposed to be somewhat imbricated; achenes oblong-turbinate, 2 lines long, not contracted under the truncate summit, the outermost sometimes villous; pappus brownish or almost rusty, the paleae oblong- to ovate-lanceolate, commonly glabrous, varying in size, only $\frac{1}{2}$ to $\frac{3}{4}$ as long as the awn.—(*M. intermedia* Greene.)

Oakland, San Francisco and northward along the coast in sandy soil.

6. *M. acuminata* Greene. Scapes few, decumbent at base, 9 to 12 in. high; leaves deeply pinnatifid into slender lobes; heads narrowly oblong, in maturity turbinate, about 1 in. high; achenes glabrous, slenderly fusiform and widest above the middle, 3 lines long; pappus 7 or 8 lines long; paleae narrowly lanceolate, gradually attenuate into an awn which is shorter than the palea.

Valleys and hills of the North Coast Ranges: Santa Rosa; Napa Range; Tehama Co. Also Sierra Nevada foothills. Well marked species.

10. *SCORZONELLA* Nutt.

Perennial herbs, with the leaves mainly in a radical tuft, the stems naked above, 1-headed, and more or less scape-like. Root fusiform. Leaves pinnatifid with linear and mostly salient lobes, or entire. Heads large, ovoid-cylindric, nodding in the bud, showy as compared with the two preceding genera, the flowers yellow and ligules elongated. Bracts of the involucre mostly thin-herbaceous, imbricated in several series. Achenes cylindric or slightly tapering downward, ribbed and obscurely angled. Paleae 10 or more, firm, tipped with a rather long subplumose or barbellate awn. (So named because of the general aspect of *Scorzonera*.)

Pappus-bristles subplumose, the paleae about 3 lines long; leaves laciniate-pinnatifid.....

1. *S. sylvatica*.

Pappus-bristles barbellate or naked.

Leaves subentire to laciniate-parted; paleae about 1 line long.....2. *S. paludosa*.

Leaves linear-lanceolate, entire or saliently lobed; paleae $\frac{1}{2}$ line long....3. *S. bolanderi*.

Leaves entire or toothed; paleae 1 to $1\frac{1}{2}$ lines long.....4. *S. procera*.

1. ***S. sylvatica*** Benth. Stem commonly simple and 1-headed, $1\frac{1}{2}$ to 2 ft. high; leaves broadly to narrowly lanceolate, laciniate-pinnatifid, the radical 5 to 8 in. long; heads 1 in. high or somewhat less; involueral bracts in 3 series, the outer ovate or ovate-lanceolate, the inner linear-oblong, all acuminate; achenes 4 lines long; pappus 7 lines long; paleae about 3 lines long, tapering into the subplumose awn which is somewhat longer.—(*Microseris sylvatica* Benth.)

Wooded hills bordering the Sacramento and San Joaquin valleys from Yuba and Colusa cos. southward to the eastern base of the Mt. Diablo range. Last of Apr.-May.

2. ***S. paludosa*** Greene. Stems several from the base, slender, 2 ft. high or more; leaves 1 ft. long, subentire to laciniate-parted into long linear lobes; heads 50 to 75-flowered; involueral bracts with a lanceolate base, tapering into a long slender acumination; achene 2 lines long; pappus brownish, the paleae little more than 1, the barbellulate awn 4 or 5 lines long.—(*Microseris sylvatica* Benth. var. *stillmanii* Gray.)

Low moist ground: Marin Co. to Solano Co.

3. ***S. bolanderi*** (Gray) Greene. Slender plants, 1 to $1\frac{1}{2}$ ft. high; stems several, decumbent, leafy at base only; leaves linear-lanceolate, entire or with a few salient linear lobes, the radical 9 to 12 in. long, including the margined petiole; bracts attenuate from a broadish base or some outer ovate, rather regularly imbricated; pappus 5 lines long, the ovate $\frac{1}{2}$ line long, abruptly tipped with the long slender awn.—(*Microseris bolanderi* Gray.)

Swampy places in the North Coast Ranges: Marin Co. northward to Mendocino and Humboldt cos.

4. ***S. procera*** (Gray) Greene. Stem robust, 2 to $3\frac{1}{2}$ ft. high, leafy-stemmed, the branches long and erect; leaves entire or denticulate, the radical and lower cauline $\frac{3}{4}$ to $1\frac{1}{4}$ ft. long and 1 to 2 in. wide, the upper cauline smaller, all acuminate and tipped with a short rigid point; involuere 1 in. high and as broad or broader; outer bracts broadly ovate and abruptly short-pointed, the inner ovate to lanceolate and attenuate; achenes $2\frac{1}{2}$ lines long; pappus 5 to 6 lines long; paleae 1 to $1\frac{1}{2}$ lines long; awn minutely scabrous.—(*S. maxima* Bioletti. *Microseris procera* Gray.)

North Coast Ranges: Sonoma Valley; Knights Valley; Cloverdale; Ukiah. June-July.

11. MALACOTHRIX DC.

Ours annual caulescent or acaulescent herbs, commonly with a radical cluster of leaves, the stems either leafy or almost naked. Heads peduncled, commonly nodding in the bud. Flowers yellow, white, or pinkish. Receptacle bristly or naked. Achenes short, glabrous, terete, 10 to 15-ribbed, or 4 or 5 of the ribs stronger than the others, truncate at apex and with an entire or denticulate border. Pappus-bristles soft, scabrous, more or less united at base and falling away together, or with 1 to 8 stronger ones which are more persistent and smoother. (Greek *malakos*, soft, and *thrix*, hair, in reference to the long wool on *M. californica*, type of the genus.)

Bracts of involucre linear to subulate, narrowly or not obviously scarious-margined, little imbricated.

Branching, mostly glabrous; heads 3 to 4 lines high.

Flowers white or pinkish; pappus not persistent.....1. *M. obtusa*.

Flowers yellow; one pappus-bristle persistent.....2. *M. clevelandii*.

Acaulescent, long-woolly when young; heads 6 to 8 lines high.....3. *M. californica*.

Bracts of involucre scarious, with green midrib, distinctly imbricated, the outer orbicular; branching and glabrous plant.....4. *M. coulteri*.

1. *M. obtusa* Benth. Stem paniculately branching above the base, 4 to 16 in. high, nearly naked; radical leaves dentate or pinnatifid, the margin often bearing scattered tufts of wool; heads small, numerous; involucre about 3 lines high, its main bracts linear, acuminate and nearly equal, with a few short ones at base, the tips usually purplish (as also in the next); achenes obovate-oblong, the summit entire, none of the pappus-bristles persistent.

Higher mountain slopes of the Coast Ranges and south to Santa Barbara Co.; also in the Sierra Nevada. May-July.

2. *M. clevelandii* Gray. Slender, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, glabrous throughout; radical leaves pinnatifid, the cauline scattered and more nearly entire; panicle narrow; heads 3 lines high, few-flowered; achenes oblong-linear, minutely striate-costate; outer pappus of one persistent bristle and a circle of white setulose teeth.—(*M. parviflora* Greene, not Benth.)

Antioch and plains bordering the eastern base of the Mt. Diablo range, south to Southern California. Apr.-May.

3. *M. californica* DC. Acaulescent; scapes 4 to 6 in. high, each bearing one rather large head; herbage conspicuously woolly when young with very long and soft hairs; leaves laciniately pinnatifid into narrowly linear or almost filiform lobes; involucre 4 to 6 lines high, its bracts narrowly linear or subulate, in about 3 ranks; bristles of the receptacle delicate, usually present; achenes narrow, lightly striate; outer pappus of 2 persistent bristles and some intervening minute teeth.

Sandy soil: Antioch to Monterey Co. and southward to Southern California. Apr.-May.

4. *M. coulteri* Gray. SNAKE'S HEAD. Simple or branching from the base, 5 to 16 in. high, the herbage glabrous and glaucous; cauline leaves sinuately pinnatifid, broad or somewhat auriculate at the sessile base and with an elongated terminal lobe; heads subglobose, $\frac{3}{4}$ to 1 in. broad; bracts of involucre silvery-scarious with a linear central portion green, regularly imbricated in several ranks, the short outer ones orbicular, the inner oval to lanceolate or linear; achenes 15-ribbed and 4 or 5-angled, the summit obscurely denticulate by projection of the ribs; 1 or 2 stouter pappus-bristles persistent.

Frequent in the lower San Joaquin Valley; southward to Southern California. Apr.

12. *HIERACIUM* L. HAWKWEED.

Ours rough-hairy perennial herbs with entire or nearly entire leaves and the heads in a panicle. Involucre cylindric or campanulate, its main bracts in 1 to 3 ranks with shorter ones at base. Achenes linear, striately ribbed, not beaked. Pappus a single row of tawny or dull white fragile capillary bristles. (Greek hierax, a hawk.)

1. *H. albiflorum* Hook. Stem nearly naked above, ending in a panicle of white-flowered heads, $1\frac{1}{2}$ to 3 ft. high; leaves and lower portion of stem thickly beset with tawny bristly hairs; leaves mostly radical, oblong, narrowed at base to a winged petiole, or the upper cauline sessile and often lanceolate and linear; involucre 3 or 4 lines high, its bracts linear-subulate; achenes reddish brown, $1\frac{1}{2}$ lines long; pappus dull white.

Dry woods in the mountains: Coast Ranges; Sierra Nevada; Southern California. June-Aug.

13. CREPIS L.

Annuals, biennials, or perennials, similar to Hieracium, but tomentulous or glabrous, not pilose. Involucre of a single row of equal scales, or often with smaller ones at base. Flowers yellow. Achenes columnar or fusiform, 10 to 20-ribbed. Pappus copious, white and soft. (Greek krepis, a sandal, the ancient name of some plant.)

Plants glabrous; heads $\frac{1}{4}$ in. high.....1. *C. virens*.
Plants tomentose; heads $\frac{1}{2}$ in. high.....2. *C. occidentalis*.

1. *C. virens* L. SMOOTH HAWKSBEARD. Annual or biennial; stem one, slender, simple below, paniculate above, 1 to 2½ ft. high; herbage green and glabrous; leaves thinnish, mostly radical, broadly oblanceolate, toothed (the teeth inclined to be salient) or shallowly pinnatifid, narrowed at base into a petiole; upper cauline lanceolate, with sessile subsagittate base; heads many, small ($\frac{1}{4}$ in. high); involucre somewhat calyculate, its bracts linear, acuminate; achenes linear-oblong, narrowed equally to each end, 10-costate, 1 line long.

Introduced European weed: spontaneous at Berkeley.

2. *C. occidentalis* Nutt. GRAY HAWKSBEARD. Perennial; stems stout, one or several, branching above, 4 to 10 in. high; herbage thinly tomentose and often glandular-hirsute above, especially on the peduncles; leaves thickish, runcinately toothed, or deeply pinnatifid into linear or lanceolate lobes, the uppermost portion entire, acuminate; involucre 6 to 8 lines high, calyculate, its bracts oblong-lanceolate; achenes brown, oblong, 10 to 18-costate, 3 lines long.

Mt. Hamilton, *Brewer*; Southern California. Widely distributed eastward to Wyoming and north to Washington.

14. AGOSERIS Raf.

Perennial herbs with strong and often deep taproots, or annuals. Stems naked and scape-like, bearing single large heads. Leaves in a radical tuft, elongated. Flowers yellow. Bracts of the campanulate involucre imbricated, the outer ovate, passing into the linear or lanceolate inner ones. Achenes terete, oblong or fusiform, 10-ribbed, prolonged into a slender or filiform beak. Pappus-bristles fine, copious, white or nearly white, inserted on the dilated apex of the beak. Achenes in fruit expanding and forming a globose head, the bracts of the involucre reflexed. (Greek agos, chief, and seris, Lettuce.)

A. Annuals.

Ligules conspicuous.....1. *A. major*.
Ligules inconspicuous.....2. *A. heterophylla*.

B. Perennials.

Achenes tapering into the beak.

Ligules elongated, much surpassing the involucre.

Coast species.

Beak not longer than body of achene.....3. *A. apargioides*.

Beak about twice as long as body of achene.....4. *A. hirsuta*.

Interior species; beak about 3 times as long as body of achene.....5. *A. grandiflora*.

Ligules very short, scarcely surpassing the involucre; bases of the Bay hills.....

6. *A. plebeia*.
Achenes abruptly beaked; montane.....7. *A. retorsa*.

1. *A. major* Jepson. Six to 18 in. high; leaves frequently pinnatifid; ligules elongated and conspicuous; achenes toothed at the apex of the body and abruptly beaked; pappus dull white.

Interior districts. Apr.-May.

2. **A. heterophylla** (Nutt.) Greene. Peduncles slender, 5 to 12 in. high, often numerous; leaves linear to spatulate or oblong, entire, denticulate, or sinuate-pinnatifid, villous-pubescent; ligules short, inconspicuous; involucre campanulate; bracts lanceolate-acuminate, the inner glabrous; achenes ribbed or the inner smoothish or merely nerved, 2 lines long or less, tapering into a filiform beak $1\frac{1}{2}$ to 3 times as long, and commonly longer than the whitish pappus; fruiting heads about $\frac{3}{4}$ in. high.—(*Troximon heterophyllum* Nutt.)

Common in the hilly districts and on the plains of the Sacramento. Surface of achenes and length of beak often exceedingly variable, even in the same head. May.

3. **A. apargioides** (Less.) Greene. Low and tufted, the stems erect or ascending from a woody caudex, 7 to 14 in. high; leaves narrow, pinnatifid into slender or remote lobes or sometimes entire; heads 6 or 7 lines high; achenes $1\frac{1}{2}$ to 2 lines long, the beak not longer than the body; pappus dull white.—(*Troximon apargioides* Less.)

Sand hills of the San Francisco Peninsula.

4. **A. hirsuta** (Hook.) Greene. About 1 ft. high, the herbage short-pubescent; leaves pinnately parted into linear lobes or spatulate and merely toothed; peduncles reddish; flowers bright yellow, fading reddish; achenes $1\frac{1}{2}$ to 2 lines long; pappus commonly dull or yellowish white.—(*Troximon humile* Gray.)

Grassy hills about San Francisco Bay. June-Aug.

5. **A. grandiflora** (Nutt.) Greene. About $1\frac{1}{2}$ ft. high; herbage hirsutely pubescent or glabrate; leaves spatulate-lanceolate, sinuate-dentate to lacinate, or with salient subfalcate lobes; flowers light yellow; bracts of the involucre lanate or tomentose when young; expanded fruiting head 2 to $2\frac{3}{4}$ in. broad; achenes $2\frac{1}{2}$ to 3 lines long; the beak 10 lines.—(*Troximon grandiflorum* Gray.)

Plains of the Sacramento Valley. Var. *INTERMEDIA* Jepson. Herbage woolly-pubescent when young; leaves pinnately parted, segments narrowly linear, rachis linear and with a linear-lanceolate terminal lobe; achenes sharply carinate-ribbed, 2 to $2\frac{1}{2}$ lines long, the beak 6 to 10 lines long; ribs along their sides more or less short-setulose.—Inner Coast Ranges: Mt. Diablo; Vaca Mts. June.

6. **A. plebeia** Greene. Robust, $1\frac{1}{4}$ to 2 ft. high; leaves narrowly oblanceolate, pinnatifid into slender upcurving lobes, the apex disposed to be entire and slenderly acuminate; ligules short, deep yellow, scarcely or not surpassing the bracts of the involucre, which are woolly at base; body of achene 2 to $2\frac{1}{2}$ lines long, the beak 5 or 6 lines long; pappus soft and white.

Oakland Hills to Southern California.

7. **A. retrorsa** (Benth.) Greene. Very woolly-pubescent when young, the wool more or less deciduous in age; peduncles 3 to 8 in. or even 2 ft. high; leaves not rarely as long as the peduncles, pinnately parted into narrowly linear or lanceolate retrorse segments, the rachis linear and the lobes more or less remote; outer bracts or involucre broad; inner linear and narrowly acuminate, as long as the pappus; ligules short; achenes $2\frac{1}{2}$ to 3 lines long, passing abruptly into the slender (9 to 10 lines long) beak.—(*Troximon retrorsum* Gray.)

Mountain summits from Mendocino Co. southward to Mt. Diablo and Southern California. May-June.

15. LACTUCA L. Lettuce.

Tall leafy-stemmed annuals or biennials with paniced heads of yellow flowers. Leaves alternate. Involucre cylindrical or in fruit conical, its bracts

imbricated in 2 or more series of unequal lengths. Rays 5-toothed at summit. Achenes obcompressed, *i. e.*, flattened parallel to the bracts, ribbed on each side, abruptly contracted into a beak, which bears at its dilated summit a copious very soft and white capillary pappus, the hairs of which fall separately. (Ancient Latin, from *lac*, milk, referring to the milky juice.)

1. **L. scariola** L. PRICKLY LETTUCE. Stem paniculately branched above, glabrous throughout, or hirsute or prickly below, 2 to 5 ft. high; leaves oblong or oblong-lanceolate, denticulate or pinnatifid, sessile or sagittate-clasping, with a row of soft prickles on the midrib; heads numerous in an open panicle, 9 to 14-flowered; involucre cylindrical, its outer bracts about $\frac{1}{3}$ the length of the inner; rays cream-yellow; achenes narrowly obovate, about as long as the filiform beak; pappus white.

Introduced from Europe: roadsides and waste places in the Bay region; common grain-field weed of the upper Sacramento Valley, where its hemp-like fibres sometimes choke and destroy the separating machines of combined harvesters. **L. SATIVA** L., with unarmed midrib, is the common Lettuce of the gardens. June-July.

TARAXACUM Ludwig. Perennial or biennial herbs with radical pinnatifid or runcinate leaves and large yellow-flowered heads solitary on a slender hollow scape. Involucre double, the outer bracts spreading or reflexed, the inner bracts erect in a single row. Achenes 4 or 5-ribbed, prolonged at apex into a very slender beak, bearing the copious soft white capillary pappus. **T. OFFICINALE** Weber. Common Dandelion. Frequent in lawns; locally established in Napa Valley, etc.

16. **SONCHUS** L. SOW-THISTLE.

Leafy-stemmed coarse annual weeds, chiefly smooth and glaucous. Heads corymbed or umbellate, swollen at base, or jug-shaped. Involucral bracts few, thin, with many shorter ones at base; these becoming callous-thickened. Achenes obcompressed, ribbed, not beaked. Pappus copious, of cottony-white exceedingly soft and fine hairs, mainly falling together. (Greek name of the Sow-thistle.)

Leaves when sessile usually sagittate-clasping; peduncles smooth; achenes longitudinally ribbed and transversely rugose.....1. *S. oleraceus*.
Leaves when sessile usually auriculate-clasping; peduncles hispid with short spreading gland-tipped hairs; achenes with 3 ribs on each side, the intervals smooth.....2. *S. asper*.

1. **S. oleraceus** L. COMMON SOW-THISTLE. Stem erect, nearly simple, 1 to 3 or 4 ft. high; leaves lyrate or runcinately pinnatifid, the terminal segment commonly large and triangular, denticulate or toothed, sagittately clasping at base, with acute lobes; lower leaves petioled; uppermost sessile and commonly lanceolate; heads about $\frac{3}{4}$ in. broad when expanded; achenes longitudinally ribbed and transversely rugose.

Naturalized European weed: old fields and waste places, flowering at all seasons.

2. **S. asper** L. PRICKLY SOW-THISTLE. Very similar to the preceding, but the leaves sometimes undivided and commonly clasping by an auricled base, the auricles rounded; achenes flat, margined with a narrow wing and marked on each side with 3 longitudinal ribs; intervals between the ribs smooth, but the ribs as well as the marginal wing rugulose or serrulate; peduncles conspicuously hirsute with spreading gland-tipped hairs.

Naturalized European weed: with the preceding but apparently not so common. There are hybrid-like intermediates.

TRIBE 2. *Cynareae*. THISTLE TRIBE.

17. *CENTAUREA* L. STAR THISTLE.

Erect or diffuse usually rigid annual or biennial herbs with alternate leaves which are not prickly, and medium-sized heads. Involucre ovoid or globose, the bracts imbricated and ending in a needle-like prickle, or at least fringed or toothed (rarely entire) appendage. Receptacle densely bristly, the bristles persistent. Flowers yellow or purple, all tubular, the marginal much larger and neutral. Achenes notched just above the base, indicating the oblique or lateral attachment. Pappus of 2 or 3 rows of bristles or short scales or none. All our species naturalized from Europe. (Named for one of the Centaurs who used it in healing.)

Flowers yellow; leaves decurrent on the stem; achenes light gray.

Plants erect, branching mostly above the base; spines 2 to 4 lines long.....

Plants diffuse, branching from the base; spines $\frac{1}{2}$ to 1 in. long.....

Flowers purple; leaves not decurrent; achenes brown.

Middle bracts ending in a very stout spine; pappus none.....

Bracts devoid of spine; pappus present.....

1. *C. melitensis* L. NAPA THISTLE. Tocalote. Erect commonly much-branched annual, 1 to 2 ft. high, with a roughish indument, the stems winged by the decurrent leaves; lowest leaves pinnatifid, the upper narrow and mostly entire; heads mostly terminal and solitary, or 2 or 3 together, $\frac{1}{2}$ in. high; bracts rigid, the outer with palmatifid spine, the intermediate and inner ones with a rigid spine 2 to 4 lines long which is either simple or with divaricate short spines at base; flowers yellow; pappus-bristles in about 3 rows, the middle row long, the outer and inner very short.

Abundant everywhere in agricultural lands and pastured hills. First introduced at Napa and diffused over the State in seed grain, hence commonly known as Napa Thistle. Our most widespread and objectionable grain-field weed. May-June.

2. *C. solstitialis* L. BARNABY'S THISTLE. Diffuse, branching from the base, 1 ft. high, cottony-pubescent; radical leaves pinnatifid, the cauline linear, entire, rather closely ascending, decurrent into long narrow wings; heads solitary at the ends of the branches, ovoid-globular; bracts much like the preceding except that the spines of the intermediate bracts are 1 in. long or less, and the innermost bracts end in a small shining appendage; flowers very bright yellow; achenes with pappus.

Cultivated fields, roadsides and waste lands, its aggressive spread continued during the last 10 years: Bay region from Sonoma, Napa and Solano cos. north to Live Oak (Sutter Co.). Aug.-Sept. Also called Yellow Star Thistle.

3. *C. calcitrapa* L. PURPLE STAR THISTLE. Coarse and rigid, forming dense bushy plants, 2 to 4 ft. high, nearly glabrous; leaves pinnately divided into few linear or lanceolate lobes, or the uppermost undivided, all serrulate, not decurrent; heads large, 1 in. high, on short peduncles scattered along the branches, or in the forks, or terminal; involueral spines very stout, $\frac{1}{2}$ to 1 in. long; flowers purple; achenes brownish, over 1 line long, destitute of pappus.

Naturalized in but a few places: San Mateo; Vacaville eastward towards Main Prairie. Keeping to uncultivated land. Aug.-Sept.

4. *C. salmantica* L. ESCOBILLA. Roughish-hispidulous, the stems nearly glabrous; leaves sinuately divided into triangular lobes below the large terminal ovate- or oblong-lanceolate lobe, not decurrent; heads on long slender peduncles, under 1 in. high; involueral bracts ovate, obtuse, not spine-tipped, the inner-

most with lanceolate scarious appendage; flowers purple; achenes with 2 or 3 rows of unequal bristles.

Healdsburg, *Alice King*.

18. CNICUS L.

Annual herb with pinnatifid or mostly sinuate-dentate leaves with spiny or prickly teeth. Heads solitary at the ends of the branches, subtended and almost concealed by the upper leaves. Bracts of the involucre imbricated in several series, the outer ovate and tipped by a simple spine, the inner lanceolate and ending in a strong pinnately branched spine. Flowers yellow. Achenes many-nerved, 10-toothed at the summit, and bearing a pappus of awns in 2 series; outer series long, naked, yellow; inner hispidulous, white. (Latin name of the Safflower, applied to thistles.)

1. *C. benedictus* L. BLESSED THISTLE. Pubescent, branching, 1 or 2 ft. high; leaves oblong or oblong-lanceolate, thin, upper clasping, lower petioled; heads 1 in. long.

Plains of the San Joaquin (Lathrop) and of the Sacramento; Napa; Healdsburg.

19. CARTHAMUS L.

Ours an annual with rigid prickly pinnatifid clasping leaves. Flowers yellow. Receptacle with linear bristle-like paleae. Outer bracts of the involucre terminating in foliaceous appendages like the stem-leaves; inner bracts more rigid, appressed, ending in a spinescent tip. Achenes obpyramidal, with a crenulate margin at the truncate summit. Pappus-paleae of 2 kinds, the outer unequal, ciliate, in several series, the inner in one series and much shorter; or pappus quite wanting in the outer row of achenes.

1. *C. lanatum* DC. DISTAFF THISTLE. The outer and inner involucreal bract differ very much.

Native of the Mediterranean Region: spontaneous at San Francisco.

20. CYNARA Vaill.

Stout perennial herb with ample pinnatifid or bipinnatifid leaves with spine-tipped segments. Flowers blue. Heads very large, solitary on the ends of the branches. Bracts of the involucre broadly ovate, obtuse or emarginate, coriaceous. Receptacle fleshy, fimbriate. Pappus of many series of plumose bristles. Achenes obovate, somewhat 4-angled. (From the Greek *kuon*, a dog, the spines of the involucre being likened to a dog's teeth.)

1. *C. scolymus* L. ARTICHOKE. One to 2½ ft. high; herbage more or less tomentose.

Garden-plant, found by waysides at Napa and Alameda and in old fields near Benicia.

ARCTIUM LAPPA L. Burdock. Coarse biennial weed; leaves very large, unarmed, roundish or ovate, mostly cordate; involucreal bracts hooked at the tip; flowers purple; pappus short, of numerous rough bristles.—Bottom lands of the Eel River near Ferndale; introduced from the Eastern United States.

21. CIRSIUM Scop. THISTLE.

Stout mostly biennial herbs. Leaves alternate, prickly or spiny, commonly toothed or pinnatifid. Heads with numerous crimson, white or yellowish flowers, perfect and all alike. Corolla tubular, its segments linear-filiform. Involucre spherical to campanulate, ovoid or cylindrical, its bracts imbricated in many ranks, at least the outer tipped with a spine or prickle, rarely innocuous. Receptacle thickly clothed with soft bristles or hairs. Achenes obovate or

oblong, compressed, not ribbed, smooth and glabrous. Pappus of a single series of bristles, plumose or barbellate to the middle, clavellate-dilated at tip, united into a ring at the base and deciduous as a whole. (Kirsion, Greek name of a kind of thistle.)

A. Naturalized species.

Stems conspicuously winged by the decurrent leaves, the wings rigid, spiny and interrupted. 1. *C. lanceolatum*.

B. Native species. Stems not decurrently winged, or if decurrent, the wing not rigid or spiny.

1. Heads nodding.

Involucral bracts herbaceous, very broad from the appressed base to the squarrose-spreading or recurved abruptly acute apex; narrower innocuous inner ones comparatively few; heads nodding. 2. *C. fontinale*.

2. Heads erect, leafy bracted.

Involucral bracts not appressed-imbricated; heads clustered or not conspicuously long-peduncled, erect as in all the following.

Leaves thin, sinuately lobed, very prickly but the prickles weak; involucre somewhat cobwebby; stems succulent; common. 3. *C. edule*.

Leaves thickish, pinnately parted into 3-lobed segments, ending in very stout spines; uppermost leaves lanceolate, as stoutly spinose-tipped as the lower; involucre arachnoid-woolly, its bracts cartilaginous at base; rare. 4. *C. andrewsii*.

Similar to the last, but the involucres glabrous; leafy bracts few, very similar to the proper bracts and pectinate-spinose; lower San Joaquin. 5. *C. crassicaule*.

3. Heads erect, naked.

a. Involucral bracts appressed-imbricate in many ranks.

Involucral bracts with the outer successively shorter, the slender short spine at their tip more or less abruptly spreading, the innermost erect, devoid of spine.

Bracts linear-lanceolate, entire, with needle-like termination.

Heads campanulate to ovate, 1 to 1½ in. high; tall glabrate plant of salt marshes. 6. *C. hydrophilum*.

Heads small, cylindric, 1 in. or less high; slender plant, 4 to 7 ft. high, commonly white-woolly. 7. *C. breweri*.

Bracts very broad and comparatively short, entire; heads 1½ to 2 in. high; plants low, commonly ½ ft. high. 8. *C. quercetorum*.

Bracts roundish and dilated at apex, the margin lacerate-fringed; heads 1 to 1¼ in. high; plants 1 to 2 ft. high. 9. *C. callilepe*.

b. Involucral bracts not appressed-imbricated; heads on long peduncles.

Involucre broadly turbinate, its bracts elongated-oblong or linear or subulate, cuspidate or scarious at apex, lacerately fringed or entire, erect or little spreading, not squarrose, glabrate or nearly so. 10. *C. remotifolium*.

Involucre campanulate and its base depressed about the summit of the peduncle; outer involucral bracts prickly-tipped, stout and squarrose-spreading.

Bracts slender, spreading, straight or incurved, appressed at the very base; corollas cream-color or white, the segments shorter than the throat; Mt. Diablo range and southern Sierra Nevada. 11. *C. californicum*.

Bracts with closely appressed base and long-lanceolate widely spreading portion, this straight, or incurved and hook-like; middle and inner Coast Ranges. 12. *C. coulteri*.

Bracts straight, densely festooned with cobwebby hairs; sand hills along the coast. 13. *C. occidentale*.

1. *C. lanceolatum* (L.) Scop. BULL THISTLE. Plant spreading, 2 to 3½ ft. high; herbage villous and green; leaves lanceolate, deeply pinnatifid into lanceolate lobes, the callous midribs and veins excurrent as rigid spines, the base decurrent on the stem into interrupted prickly wings; upper surface strigose-setulose; heads large, almost 2 in. high, terminating leafy branchlets; bracts of involucre lightly arachnoid-lanceolate, attenuate into slender and rigid prickly pointed spreading tips; flowers rose-purple.

European species, introduced in recent years in the Bay region: Berkeley; lower San Joaquin, etc.

2. *C. fontinale* (Greene) Jepson. Stout, about 2 ft. high, the branches widely spreading; stems and upper surface of leaves more or less glandular-

pubescent; heads mostly clustered, nodding; bracts of the involucre very broad, almost 3 lines in width from the base to the abruptly acute apex, spreading or recurved from near the middle, prickle-pointed; flowers dull white; anther-tips acute.—(*Carduus fontinalis* Greene.)

Crystal Springs, San Mateo Co., having the aspect of an introduced plant. Bracts similar to *C. quercetorum*, but the long-attenuate innocuous inner ones comparatively few.

3. *C. edule* Nutt. Stem simple, robust but tender and succulent, $3\frac{1}{2}$ to nearly 6 ft. high, pubescent and leafy to the top, the leaves thin; radical leaves 8 to 10 in. long, narrowly oblanceolate, shallowly (rarely deeply) sinuate-pinnatifid, very prickly-ciliate but the prickles weak; cauline leaves similar to oblong or narrower; heads depressed-globose, 1 to $1\frac{1}{2}$ in. high, few in a terminal cluster, leafy-bracted at base; involucre conspicuously arachnoid-woolly when young, nearly glabrate in age; bracts lanceolate-subulate, setaceous; flowers dull purple or whitish, segments of the corolla shorter than throat and with callous thickening at apex.—(*Cnicus edulis* Gray.)

Common along creeks and gulches in the Coast Ranges: San Francisco Peninsula; Oakland Hills; Marin Co. and northward. June.

4. *C. andrewsii* (Gray) Jepson. Doubtless tall and slender, branching at summit, the loose wool deciduous except from the heads; stem strongly striate; radical leaves 16 in. long, deeply sinuate-pinnatifid in 3-cleft lobes terminating in a stout spine, the outline oblong but the lobes toward the base obsolete, resulting in a prickly-margined petiole about 4 in. long; upper leaves lacinate-pinnatifid and with narrowly lanceolate prickly lobes; heads somewhat clustered or pedunculate, hemispherical, 1 to $1\frac{1}{4}$ in. high, leafy-bracted at base; involucre arachnoid-woolly, becoming flocculent; bracts with coriaceous oblong-ovate base, the short upper part greenish, and abruptly contracted into an awn-like spine; corolla apparently whitish, its segments longer than the throat.—(*Cnicus andrewsii* Gray.)

Tennessee Bay, *Eastwood*; first collected by Dr. Andrews at some now unknown station in California.

5. *C. crassicaule* (Greene) Jepson. Stems 3 or 4 ft. high, very stout below, hollow, 1 in. thick, striate, branching above, and bearing a panicle of 6 to 9 subsessile or short peduncled heads; herbage in the mature plant gray-pubescent, especially the under surface of the leaves; leaves similar to the preceding; heads $1\frac{1}{4}$ to rather less than 1 in. high; involucre turbinate-campanulate, perfectly glabrous in age; proper bracts linear-lanceolate to lanceolate-acuminate, entire and tipped with a rather long slender prickly; leafy bracts with a few strong prickles or pectinate-spinescent, the inner sometimes apparently passing into the proper bracts; flowers whitish or pinkish; segments about as long as the throat.—(*Carduus crassicaulis* Greene.)

Roadsides and low fields of the San Joaquin between Banta and Lathrop. July. The glabrous involucre and the lanceolate-acuminate bracts will distinguish this species from the at present known forms of *C. andrewsii*, the bracts of which are abruptly attenuate. Possibly not a native.

6. *C. hydrophilum* (Greene) Jepson. Tall, freely branching above, $3\frac{1}{2}$ to 6 ft. high, thinly pubescent, in maturity green and glabrate; leaves deeply pinnatifid into mostly 3-lobed segments; heads 1 to $1\frac{1}{2}$ in. high, paniculate or clustered at the ends of the branches; involucre ovate to campanulate, the bracts appressed-imbricated, narrowly lanceolate with a glutinous ridge toward the summit, tipped with a diverging prickly, perhaps the uppermost portion of the very slender bracts also diverging.—(*Carduus hydrophilus* Greene.)

Suisun Marshes; probably a salt marsh form of the next.

7. **C. breweri** (Gray) Jepson. Commonly white-tomentose, sometimes nearly green, slender, and tall, 5 to 8 ft. high; lower leaves ample, rather narrowly oblong, irregularly and shallowly sinuate, almost devoid of prickles; upper leaves mostly elongated-lanceolate, conspicuously prickly; heads numerous, paniculate, often rather densely so, at summit of the stem, less than 1 in. high, oblong or oblong-ovate; bracts of the globular involucre lanceolate, much appressed, firm-coriaceous, bearing towards the apex a glandular or viscid spot or ridge; outer and middle bracts abruptly tipped with a mostly spreading weak prickly; corollas pale purple or whitish, the lobes shorter than the throat; anther-tips deltoid, merely acute.—(*Cnicus breweri* Gray.)

Wet places in the Coast Ranges, not common: San Juan; Napa Valley; Ft. Bragg; Lyon's Valley (Mayacamas Range) and northward to Mt. Shasta. July-Aug.

8. **C. quercetorum** (Gray) Jepson. Perennial by branching horizontal rootstocks; stem short, 4 to 6 in. (rarely 1 ft.) high, bearing a few large heads; herbage arachnoid-tomentose when young, especially on the under surface of the leaves, eventually glabrate; heads $1\frac{1}{2}$ to 2 in. high, sometimes as thick; leaves mostly petiolate, 4 to 9 in. long, pinnately parted and the oblong or lanceolate divisions often 3 to 5-left or -divided, strongly or weakly prickly; involucre bracts thickish, coriaceous, closely imbricated in many ranks, the outermost ovate (about 3 lines long), the inner becoming lanceolate, all with a short cusp rather less than 1 line long or sometimes blunt; innermost bracts obscurely scarious at tip; flowers purplish or whitish; four of the corolla-lobes united higher, the other longer than the throat.—(*Cnicus quercetorum* Gray.)

Coast Ranges: Fort Ross; Napa; Marin Co.; San Juan and southward to San Diego Co. June-Aug.

9. **C. callilepis** (Greene) Jepson. Stems several from the crown of the perennial root, about 2 ft. high; leaves oblong-ob lanceolate in outline, pinnately lobed, moderately prickly, bright green above, lightly arachnoid-tomentose beneath, 4 to 7 in. long; heads medium, in flower 1 to $1\frac{1}{4}$ in. high, commonly borne in pairs on longish but rather unequal peduncles; bracts of the involucre oblong, scariously margined and dilated at apex, cuspidate and lacerately fringed; innermost bracts elongated-oblong or lanceolate, ending in a scarious innocuous point; lobes of the corolla as long as the throat.—(*Carduus callilepis* Greene.)

San Francisco; Berkeley Hills; Marin Co. May-July. Rather uncommon.

10. **C. remotifolium** (Gray) Jepson. Plants 3 to 8 ft. high; herbage nearly glabrate, loosely arachnoid or minutely flocculent; leaves pinnately lobed to divided, the divisions of at least the lower divergently 3-lobed, more or less whitened by the loose tomentum beneath even in age; heads in flower 1 in. or at most $1\frac{1}{2}$ in. high, rather long-peduncled, naked or nearly so at base; involucre broadly turbinate, lightly arachnoid and glabrate; bracts elongated-oblong or linear or subulate, scariously margined and commonly somewhat fimbriate towards the cuspidate tip; corolla yellowish white, its segments much shorter than the throat; pappus of coarse bristles, the strongest with club-shaped tips.—(*Cnicus remotifolius* Gray.)

Dry mountain ridges from Knoxville, Napa Co., northward. Aug. In plants from Lake Co. the bracts of the involucre are frequently not lacerate nor scarcely scarious-margined. Plants from Howell Mt. referred to this species have clustered instead of solitary heads on long peduncles, and campanulate involucre.

11. **C. californicum** Gray. Tall and paniculately branching, often 4 to 6 ft. high, very leafy toward the base, the white wool more or less deciduous; leaves narrow, mostly about 6 in. long, from sinuately to deeply pinnatifid, moderately prickly; heads solitary on long peduncles, $1\frac{3}{4}$ to 2 in. high, naked; involucre hemispherical, somewhat woolly; bracts with coriaceous base and lanceolate spreading but incurved upper portion, the terminal prickle short; corollas cream-color, white or rarely purple; lobes shorter than the throat; anther-tips deltoid.—(*Cnicus californicus* Gray.)

Mt. Diablo range (acc. to Greene): common in the Sierra Nevada from the Stanislaus to Coulterville and southward.

12. **C. coulteri** (Gray) Jepson. Stems freely branching above, $3\frac{1}{2}$ to 7 ft. high; herbage white-tomentose or becoming green; radical leaves pinnately parted into lanceolate divisions, 10 to 15 in. long; lower prickles, 8 in. long, decurrent for about $\frac{1}{2}$ in.; uppermost leaves lanceolate; heads large, nearly 2 in. high, on almost naked peduncles 1 ft. or more long; involucre hemispherical, less woolly than the next or nearly glabrous; bracts of involucre with appressed subcoriaceous base and the long lanceolate prickle-tipped upper portion spreading, either straight or incurved, or sometimes the outermost deflexed; innermost bracts erect; flowers bright crimson; corolla-segments longer than the throat; pappus-bristles barbellate above, the tips scarcely dilated.—(*Carduus venustus* Greene.)

Higher hills and mountains of the Coast Ranges from Ukiah and the Vaca Mts. to Berkeley, Mt. Diablo and southward to the Santa Cruz Mts. June-July. A strikingly handsome species passing by numerous graduations into *C. occidentalis*. The spreading bracts are frequently developed into grappling-hook-like appendages nearly 1 in. long.

13. **C. occidentalis** (Nutt.) Jepson. Stout, $1\frac{1}{2}$ to 3 ft. high, very white with thick coating of cottony wool; leaves from sinuate-dentate to pinnatifid, not very prickly, glabrate above, canescent beneath; heads subglobose, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. high or nearly naked peduncles; involucre bracts straight and subulate-lanceolate, with short spines, not widely spreading, densely festooned with cobwebby hairs; flowers red or purple; corolla-segments longer than the throat; anther-tips narrow and acuminate; pappus rather scanty.—(*Carduus occidentalis* Nutt.)

Common on sandy hills near the coast, from San Francisco southward. The bracts, excepting their spiny tips, are quite concealed by the dense wool. Even at a short distance from the sea the characters are, however, less pronounced, the involucre being less arachnoid-woolly and the bracts somewhat curved or diverging from the appressed base; proceeding inland to the middle Coast Ranges, one meets typical *C. coulteri*, with nearly or quite glabrous involucre and characteristic bracts. This form is repeated about Mt. Shasta and in the northern Sierra Nevada but the heads and whole plant are almost snow-white woolly, when it is *Carduus candidissimus* Greene.

22. **SILYBUM** Gaertn.

Annual or biennial herb with very ample sinuate-pinnatifid prickly clasping leaves, smooth and shining above and very conspicuously blotched with white along the veins. Heads very large, solitary at the ends of the branches. Flowers purple. Corollas with filiform tube conspicuously dilated below the narrowly linear lobes. Bracts of the involucre broad, appressed, bearing an abruptly spreading spine which is broadly lanceolate or ovate and ciliate-prickly toward the base. Pappus-bristles in several series, flattish, minutely barbellate. (Old Greek name applied to thistle-like plants.)

1. **S. marianum** Gaertn. MILK THISTLE. Branching, 3 to 6 ft. high; leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, 6 to 12 in. wide, strongly undulate at the sinuses; heads about 2 to $2\frac{1}{2}$ in. broad; spines of the middle involucre bracts 1 to $1\frac{1}{2}$ in. long.

Common in abandoned fields and by roadsides throughout California. Naturalized from the Mediterranean Region. May-Aug.

TRIBE 3. Senecioneae. GROUNDSEL TRIBE.

23. PETASITES Gaertn. SWEET COLTSFOOT.

Perennial herbs with creeping rootstocks from which arise in early spring scape-like flowering stems (with many scale-like leaves) and later ample radical leaves. Heads in a dense corymb, subdioecious, *i. e.*, the plants mostly sterile or mostly fertile, the whitish sterile flowers with tubular 5-cleft corolla, and the pinkish fertile flowers with ligulate corolla. Achenes 5 to 10-ribbed. Pappus elongating with age, very soft and white. (Greek petasos, a broad-brimmed hat, in allusion to the large leaves.)

1. **P. palmata** (Ait.) Gray. Stem 7 to 10 in. high, glandular-pubescent, its bract-like scales $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; leaves roundish in outline, green and nearly glabrous above, densely white-tomentose beneath, at least when young, 12 in. broad or less, palmately cleft to below the middle into 7 to 10 lobes, the lobes denticulate, sinuately toothed or 3-lobed at apex; petioles 4 to 7 in. long; heads 7 lines high; "sterile" heads with mostly perfect flowers but the marginal flowers pistillate:—perfect flowers with the slender tube abruptly dilated into a campanulate throat and 5-cleft limb and the style thickened or club-shaped above, minutely papillate, and minutely cleft at the acute tip; pistillate flowers with the style obscurely notched and but $\frac{1}{2}$ as long as the ligule; "fertile" heads with mostly pistillate flowers but with a few perfect flowers in center of head:—pistillate flowers with style nearly as long or much longer than the ligule and distinctly cleft at tip, the ligule smaller than in "sterile" heads.

Deep shades of wooded cañons in ranges near the coast from the Santa Cruz Mts. and Camp Taylor to Eureka, Tracy, northward to Alaska and far eastward to New England.

24. CACALIOPSIS Gray.

Floccose-woolly perennials with mostly radical palmately cleft or parted leaves and few rayless heads of numerous flowers terminating the stoutish stems. Involucre broadly campanulate, its bracts many, linear-lanceolate, acuminate, rigid rather than herbaceous. Receptacle naked. Anthers entire at base. Style puberulent below the slightly flattened branches. Achenes 10-nerved. Pappus copious, soft and white, equaling the corolla. (Greek kakalia, ancient Greek name of some plant, and ops, likeness.)

1. **C. nardosmia** Gray. One to $1\frac{1}{2}$ ft. high; leaves palmately parted or cleft, the divisions broad, cleft or toothed, the radical $2\frac{1}{2}$ to $3\frac{1}{2}$ in. broad on petioles $2\frac{1}{2}$ to 4 in. long, the cauline few, similar to the radical but smaller; heads about 1 in. high, corymbosely disposed at the nearly naked summit of the stem; flowers yellow, honey-scented.—(Adenostyles nardosmia Gray.)

Geysers, Sonoma Co.; Mendocino and Humboldt cos. and northward. Apr.-May.

25. LUINA Benth.

Cottony-pubescent low plants with many erect simple stems. Leaves al-

ternate, entire, sessile. Heads rayless, about 10-flowered, disposed in terminal corymbs. Flowers yellow. Involucre oblong-campanulate, its bracts 8 to 10 or 12, linear, rigid, carinately 1-nerved, equal. Receptacle naked. Corolla funnelform. Anthers sagittate at base. Style glabrous, its flattened branches papillose on the back. Pappus soft and white. (Anagram of Inula.)

1. *L. hypoleuca* Benth. var. *californica* Gray. Stems nearly 1 ft. high from a woody rootstock, white-tomentose; leaves ovate-oblong to elliptic, 1 in. long, white with wool beneath, becoming glabrous and green on the veiny upper surface; heads 5 or 6 lines high, several in an open cluster.

Rare plant of the coast region: Chimney Rock, Mendocino Co.; Santa Cruz Mts., Kellogg.

26. ARNICA L.

Perennial montane herbs, somewhat glandular or aromatic. Stem single, bearing 1 to several large heads at the summit. Leaves all opposite or the upper alternate. Involucre broadly campanulate, not calyculate at base; bracts lanceolate, equal, somewhat in 2 ranks. Receptacle flat, naked. Disk-flowers many, yellow; ray-flowers pistillate when present, yellow. Achenes slender and somewhat spindle-shaped, with a callous knob at base. Pappus a single row of rather rigid and strongly roughened denticulate white bristles. (Origin of name obscure.)

Rays none; leaves more or less coarsely dentate.....1. *A. discoidea*.
Rays present; leaves more or less serrate.....2. *A. latifolia*.

1. *A. discoidea* Benth. COAST ARNICA. One and one-half to 2¼ ft. high, glandular- or viscid-pubescent especially above; leaves ovate or oblong, irregularly and often coarsely dentate, rounded or truncate or cordate at base, 4 in. long or less, on petioles nearly their own length; cauline sessile, reduced, often with salient teeth, the upper sometimes alternate; heads ¾ in. high or nearly so; rays none; involucre villous-glandular; achenes sparsely hispidulous, 2 to 3 lines long.

Dry open woods: frequent in the Coast Ranges from San Luis Obispo to Monterey, Mt. Tamalpais, Mt. Diablo and northward beyond our limits. May-Sept.

2. *A. latifolia* Bong. Ten to 18 in. high, more or less glandular but seemingly glabrous; leaves opposite, with 3 or 4 cauline pairs, the lower ovate or roundish and petioled, the upper narrower and sessile, sharply serrate (especially the middle ones) or some entire; heads 7 to 9 lines high; rays 7 lines long.

Montane: Mt. Hamilton; Sierra Nevada.

27. SENEIO L. GROUNDSEL.

Herbs with alternate leaves and heads in terminal corymbs, rarely solitary. Heads many-flowered. Flowers yellow in both disk and ray, the latter pistillate or none. Involucre cylindrical to campanulate, with 1 or 2 rows of bracts of equal length, naked or with some small short bracts at base; bracts erect or connivent. Receptacle flat, naked. Achenes terete. Pappus of abundant white and soft hairs. (Latin senex, an old man, on account of the white hair-like pappus.)

A. Annuals.

Rays none; involucre with small black bracts at base.....1. *S. vulgaris*.
Rays inconspicuous, recurved; involucre naked at base.....2. *S. sylvaticus*.

Herbs.

B. Perennials.

Heads with rays.

Leaves more or less bipinnately dissected or incised; heads many...3. *S. corycephalus*.

- Leaves coarsely dentate; heads 1 to 3.....4. *S. greenei*.
 Leaves entire; heads many to numerous.....5. *S. clevelandii*.
 Heads rayless.

Herbage more or less woolly at least when young; montane plants.....
 6. *S. aronicoides*.

- Herbage glabrous; plants of brackish marshes.....7. *S. hydrophilus*.
 Bush; heads with rays; leaves divided into 3 to 7 or 9 linear lobes.....8. *S. douglasii*.
 Climbing plants; heads rayless; leaves with reniform stipules.....9. *S. mikanioides*.

1. *S. vulgaris* L. COMMON GROUNDSEL. Stem simple or branching, 6 to 12 in. high; herbage glabrous or with a little loose tomentum; leaves pinnatifid with jagged margin; heads in terminal corymbs, disposed to be sessile in clusters; involucre cylindrical, 4 lines long, consisting of about 20 equal black-tipped bracts with several to many conspicuously black-tipped small ones at base; achenes slightly hairy.

Very common; naturalized European weed. Feb.-Apr. Sometimes called "Old Man of Spring." Reputed poisonous to some animals.

2. *S. sylvaticus* L. Very similar to the preceding but the leaves mostly linear to oblong, less pinnatifid, dentate, or nearly entire; heads commonly looser in the corymb; bracts of involucre not black-tipped, the small ones at base wanting or minute; rays about 5, minute, recurved, or sometimes wanting; achenes appressed-pubescent.

Seldom seen or passed over for *S. vulgaris*: San Luis Obispo; Vallejo.

3. *S. eurycephalus* T. & G. Stem leafy, often much branched at the summit, 1 to 2 $\frac{3}{4}$ ft. high; herbage floccose-woolly when young, and either glabrate or not glabrate at flowering time; leaves deeply pinnatifid, the lobes cuneate-obovate, entire, coarsely serrate or incisely cleft, or the terminal portion unsegmented; heads 5 lines high, many in an ample corymb; involucre campanulate at base, somewhat contracted above, its bracts linear-oblong, somewhat acute, scarious-margined; rays 7 to 12, the ligules 6 lines long.

Open woods bordering the bases of low hills in the Coast Ranges: Southern California. Common and variable.

4. *S. greenei* Gray. Stem seldom 1 ft. high, bearing 1 to 3 short-peduncled heads; herbage lightly floccose-tomentose; radical leaves roundish with abrupt or somewhat cuneate base, coarsely dentate, barely 1 or 2 in. long, on slender petioles; cauline leaves few, sessile, oblong or the uppermost lanceolate and entire, sometimes bract-like; heads $\frac{2}{3}$ in. long; bracts of involucre linear, none calyculate; rays deep orange, $\frac{1}{2}$ in. or more long; style-tips of disk-flowers conspicuously penicillate-margined and with a central cusp; achenes glabrous.

Mountains near the Geysers; Mt. Sanhedrin. Rarely collected.

5. *S. clevelandii* Greene. Stems commonly 2 ft. high, corymbosely branched at summit, but the inflorescence rather strict, herbage glaucous and glabrous, except the small flocs of white tomentum in the axils of the upper leaves and bracts; leaves mostly in a radical tuft, oblong, mostly 3 in. long, tapering to both ends from the middle or broadest above the middle, entire, obtuse, on petioles 3 to 5 in. long; uppermost leaves similar but smaller; heads numerous in a compound corymb, 3 lines high; rays deep orange, 2 lines long; achenes glabrous.

Cañon bottoms and moist beds of rivulets in the hills of northern Napa Co. and southern Lake Co. July.

6. *S. aronicoides* DC. Stem robust, 1 to 3 ft. high, leafy chiefly at the base or below the middle; younger parts loosely woolly, soon glabrate; heads 5 lines high, many in a compound terminal cyme, or the inflorescence much

reduced and the heads few; basal leaves ovate to oblong, 3 to 8 in. long, on petioles 5 in. long or less, irregularly and coarsely toothed, denticulate or almost entire; cauline leaves similar or mostly lanceolate, reduced and auricled at base, the uppermost bract-like; involucre bracts lanceolate, either with or without purple tips; flowers 15 to 26 or only 10 or 12; rays none, rarely 1 or 2; achenes $1\frac{1}{2}$ lines long, glabrous.

Thickets or sparsely chaparral-covered country: Mt. Day; San Francisco; Mt. Tamalpais; Berkeley Hills; Mt. Diablo; Vaca Mts.; Calistoga, etc. Common and widely distributed in the Bay region, but variable in aspect and not abundant in any one locality. Cauline leaves often more irregularly or saliently toothed than the basal ones.

7. **S. hydrophilus** Nutt. Stem purplish, 2 or 4 ft. high, strict, few-leaved; herbage somewhat succulent, glabrous, more or less glaucous; leaves fleshy-coriaceous, entire or barely denticulate; the radical and lowest cauline oblanceolate and stout-petioled, 8 to 11 in. long, $1\frac{1}{2}$ in. wide, the upper cauline sessile or partly clasping; heads often very numerous, cymose-corymbose, small (5 lines high), short-pediceled; involucre campanulate, slightly calyculate; rays none or rarely few.

Abundant in the Suisun Marshes and found in other marshes about San Francisco Bay; thence northward. May-July.

8. **S. douglasii** DC. (CREEK SENECEO. Bush 3 ft. high, leafy up to the inflorescence; herbage at first whitish-tomentose, later more or less glabrate; lower leaves pinnately divided into 5 to 9 narrowly linear revolute lobes, the upper with only 3 lobes (the middle one several times larger), or the uppermost entire; heads 7 lines high; involucre broadly turbinate, the bracts linear with attenuate tips, dorsally carinate below; rays about 13, the ligules 5 lines long; achenes linear, canescent, 2 lines long.

Dry stream beds, in late summer or autumn: Putah Creek; Napa Co., and southward through the Mt. Diablo region to Southern California.

9. **S. mikanoides** Otto. IVY SENECEO. Climbing by twining stems over shrubs and trees to a height of 5 to 20 ft.; leaves ivy-like, roundish-cordate, sharply 5 to 7-angled; petioles as long or longer; stipules reniform, present except on the uppermost leaves; corymbs more or less paniculate; heads linear-oblong, 5 to 7 lines long, the involucre about $\frac{1}{2}$ the length of the corollas.

Along streams at the western base of the Oakland Hills; Berkeley; Temescal Creek; Mills College. Also at San Luis Obispo (1906). Jan. Naturalized from South Africa.

TRIBE 4. **Anthemideae.** MAYWEED TRIBE.

28. **ANTHEMIS** L. CHAMOMILE.

Branching herbs. Leaves alternate, finely and pinnately dissected. Heads solitary on terminal peduncles, $\frac{3}{4}$ to 1 in. broad. Ray-flowers white, pistillate, the spreading rays at length reflexed; disk-flowers yellow. Involucre hemispherical, its bracts scariosus and at length dry, imbricated in several series. Receptacle conical, with chaff-like bracts toward the summit. Achenes angled or striate, not hairy. Pappus none. (Ancient Greek name of the Chamomile.)

1. **A. cotula** L. MAYWEED. Annual, 1 to 2 or rarely 3 ft. high; herbage ill-scented, nearly glabrous; bracts narrow and acute, or awl-like; ray-flowers 14 to 20, sterile; achenes rugose, 10-ribbed.

Abundant in pastures and waste ground. Naturalized from Europe. May-Aug.

A. nobilis L. Garden Chamomile. Perennial, 6 to 12 in. high, the erect

peduncles from procumbent branches; herbage pubescent, aromatic; bracts broad, membranous, obtuse; ray-flowers 12 to 19, fertile; achenes smooth, angled. On the coast at Ft. Bragg; sparingly naturalized from Europe.

29. *ACHILLEA* L. YARROW.

Perennials herbs with alternate leaves, in ours pinnately divided into many fine segments. Heads in a terminal corymb, radiate; rays few, white; disk-flowers yellow; both disk and ray fertile. Involucre oblong or ovoid, its bracts imbricated, with scarious margins. Receptacle chaffy, nearly flat. Achenes strongly obcompressed, callous-margined, destitute of pappus. (In honor of Achilles.)

1. *A. millefolium* L. COMMON YARROW. MILFOIL. Stems simple, erect or ascending at the very base, 2 to 3 ft. high; herbage pubescent; leaves linear-lanceolate in outline, the multifid divisions crowded on the rachis; corymb compound, flat-topped; rays 4 or 5.

Common throughout California: along the coast, on low interior hills, and even in the most remote mountain ranges; appearing as if native. Mar.-July.

30. *CHRYSANTHEMUM* L.

Annual or perennial herbs, ours with toothed or incised leaves. Heads large, solitary on leafy-bracted peduncles. Disk-flowers yellow; rays yellow or white. Receptacle flat or hemispherical, naked. Achenes glabrous, at least those of the disk 5 to 10-ribbed all around. (Greek *chrusos*, gold, and *anthemon*, a flower.)

1. *C. segetum* L. CORN CHRYSANTHEMUM. Annual, erect, 1 to 2 ft. high; herbage glabrous; lower leaves pinnatifid or incised; upper merely denticulate, sessile by a clasping base; heads (including the yellow rays) 2 in. wide; ray achenes broad, 3-sided, lateral angles winged and few-toothed; disk achenes cylindric.

Fields at West Berkeley; Mendocino City. May-June.

C. LEUCANTHEMUM L. Ox-eye Daisy. Involucral bracts with dark red margins; rays white.—Sierra Nevada; reported from Santa Cruz.

31. *MATRICARIA* L.

Ours glabrous annuals with pinnately dissected leaves. Heads solitary or somewhat corymbose, with many greenish yellow flowers. Receptacle slender-conical, naked. Bracts of the involucre imbricated, with scarious margins, persistent. Corollas tubular, without limb. Rays none. Pappus reduced to a membranous crown or border, or none. Achenes glabrous, 3 to 5-nerved on the sides, rounded on the back. (Latin *matrix*, because used medicinally.)

Heads 2 to 4 lines high; achenes with an obscure margin at summit.... 1. *M. suaveolens*.
Heads mostly 4 to 6 lines high; achenes with a broad crown, or a lobed 1-sided pappus....

2. *M. occidentalis*.

1. *M. suaveolens* (Pursh) Buch. PINEAPPLE WEED. Branching, 2 to 10 in. high; herbage sweet-scented; heads short peduncled, 2 to 3 (or 4) lines high; bracts of the involucre broadly oblong.—(*M. discoidea* DC.)

Common in beaten roadways, about old farm buildings and in pasture lands throughout California. Apr.-May. Doubtfully native; a similar query also to be set against the next.

2. *M. occidentalis* Greene. Either branching or unbranched below the corymbose summit, 1½ to 2 ft. high; herbage not so strongly scented; heads as much as 1½ in. high; achenes sharply angled, with a broad crown-like margin, or lobed and 1-sided.

Rich soil of fields: Sacramento Valley; San Francisco and southward to Southern California.

32. TANACETUM L.

Strong-scented perennial herbs. Leaves 2 or 3 times pinnately divided into numerous small lobes. Heads discoid, many-flowered, borne in a corymb-like peduncled cluster. Flowers yellow. Involucre of numerous scale-like bracts. Receptacle flat or low, naked. Achenes 5-ribbed or 3 to 5-angular, with broad truncate summit bearing a low crown-like pappus or none. (Name obscure.)

1. **T. camphoratum** Less. DUNE TANSY. Villous-tomentose when young, the wool more or less deciduous in age; herbage with the aroma of camphor; stems robust, decumbent or ascending, 1 to 2½ ft. long; primary and secondary divisions of leaves much crowded, the latter oval or oblong, the margin more or less revolute; achenes glandular.

Sand-dunes at San Francisco. Aug.-Nov.

33. ARTEMISIA L. SAGE BRUSH.

Herbs or shrubby plants, mostly bitter and aromatic, with alternate leaves. Heads small, nodding or erect, in panicked spikes or racemes. Flowers yellow or purplish; rays none. Disk-flowers perfect and marginal ones pistillate or all perfect. Rays none. Corollas of the pistillate flowers 2 or 3-toothed, of the perfect flowers 5-toothed. Involucre imbricated, dry and scarious. Receptacle nearly flat, naked. Achenes obovoid or oblong, glabrous, with a small terminal areola. Pappus none. (Named for Artemisia, wife of Mausolus, king of Caria.)

Shrub; herbage grayish-puberulent; leaves linear-filiform and entire or with linear filiform divisions; involucre hemispherical.....3. *A. californica*. Herbaceous or somewhat woody at base.

Involucre oblong; leaves green above, commonly white-tomentose beneath, broad, often pinnatifid1. *A. heterophylla*.

Involucre hemispherical.

Herbage green, glabrous; leaves bipinnately divided, the divisions serrulate or incised... 2. *A. biennis*.

Herbage green and nearly glabrous; leaves linear, entire.....4. *A. dracunculoides*.

Herbage densely silky-villous all over; leaves once to thrice pinnately divided into linear entire segments.....5. *A. pycnocephala*.

1. **A. heterophylla** Nutt. CALIFORNIA MUGWORT. Stems from running rootstocks, erect, woody at base, strict, 3 to 6 ft. high; leaves lanceolate to oblong, ovate or elliptic, sparingly pinnatifid (with downward incisions), cleft or often entire (especially the upper), green above, white-tomentose beneath, sometimes glabrous; heads mostly erect, in dense spikes in an open or more commonly dense terminal panicle, the main axis leafy; involucre oblong, glabrous; marginal flowers pistillate, disk-flowers perfect, all fertile, as also in the next two species.

Common along stream-banks and elsewhere throughout California. Leaves usually large, often 6 in. long and 2½ broad, exceedingly polymorphic as to the margin.

2. **A. biennis** Willd. Glabrous inodorous tasteless biennial, erect, virgate, 1½ to 3 ft. high; leaves bipinnately divided into lanceolate or broadly linear incised or serrulate divisions, or the uppermost merely pinnatifid; heads crowded on the short branchlets, the whole inflorescence spike-like and more or less leafy; achenes with small epigynous disk.

Introduced weed: West Berkeley; lower Sacramento River.

3. **A. californica** Less. OLD MAN. Gray shrub, 2½ to 4 ft. high; leaves with a minutely appressed pubescence, the lowest palmately once or twice parted into linear-filiform segments, the upper entire and more or less fas-

ciesed; heads many, nodding in long racemose panicles, involucre $1\frac{1}{2}$ or 2 lines broad; achenes with a minute squamellate crown-shaped pappus.

Exposed slopes of hills, often gregarious; Berkeley Hills and Mt. Diablo range southward to Southern California.

4. *A. dracunculoides* Pursh. Glabrous, not aromatic, perennial; stems 2 to $4\frac{1}{2}$ ft. high, either virgately or paniculately branched; leaves linear, less than 1 to 2 lines broad, entire or the lowermost 3-toothed or -cleft; heads numerous, nodding on very slender short peduncles in a close or open panicle, the clusters sometimes secund on the slender branches; marginal flowers fertile, disk-flowers perfect but sterile, as also in the next.

San Leandro Creek, acc. to Bot. Cal.; Southern California; common in the Sierra Nevada, thence far eastward and northward.

5. *A. pycnocephala* DC. Stems stout, simple, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high, somewhat woody at base, crowded with leaves up to the inflorescence; herbage densely silky; leaves once to thrice pinnately divided into linear lobes; heads erect, in spikes, the spikes crowded in a dense virgate panicle; heads almost or quite 2 lines in diameter; involucre densely villous.

Sand hills along the coast from Monterey to San Francisco and north to Humboldt Co.

34. COTULA L.

Low strong-scented herbs. Leaves alternate, dissected or lobed, or with some entire on the same plant. Flowers yellow. Heads slender-peduncled, discoid, low-hemispherical. Bracts of involucre greenish, in about 2 ranks. Receptacle flat or nearly so, naked. Outer series of flowers pistillate only and apetalous. Disk-flowers with 4-toothed corolla, fertile or infertile. Mature achenes raised on pedicels, compressed, spongy-margined or narrowly winged, destitute of pappus. (Greek kotule, small cup or low vessel.)

Annual; leaves pinnately dissected; pistillate flowers in 2 or 3 rows.....1. *C. australis*.
Perennial; leaves some pinnatifid and some entire, sheathing at base; pistillate flowers in a single row.....2. *C. coronopifolia*.

1. *C. australis* Hook. f. Slender, branching, 2 to 5 in. high; herbage with scattered soft spreading hairs; leaves pinnately or bipinnately dissected into linear lobes; heads very small, 1 to $1\frac{1}{2}$ lines broad; bracts of involucre brownish-tipped and with scarious edges; pistillate flowers in 2 or 3 rows, pediceled; disk-flowers nearly or quite sessile; marginal achenes somewhat compressed, minutely hispid on both faces but the margin glabrous.

Streets of towns and cities: Berkeley; Oakland; San Francisco. Jan.-Mar. Naturalized from Australia.

2. *C. coronopifolia* L. BRASS BUTTONS. Perennial, somewhat succulent, often subaquatic; stems commonly many and clustered, decumbent, $\frac{1}{2}$ to 1 ft. long; leaves linear, lanceolate, or oblong, entire, coarsely toothed or pinnatifid on the same plant, dilated at base into a short sheath round the stem; heads depressed, 4 to 5 lines broad; pistillate flowers in a single row, on pedicels as long as the involucre, without corolla; disk-flowers on much shorter pedicels.

Saline localities everywhere and in springy places in the hills, most abundant in salt marshes about San Francisco Bay and flowering from Mar. to Dec. One of the first plants to appear on the reclaimed mud flats. Naturalized from South Africa.

35. SOLIVA R. & P.

Small depressed annual with rigid short branches, petioled and pinnately dissected leaves, and discoid heads of greenish flowers sessile in the forks.

Involucre of 7 or 8 greenish nearly equal bracts. Receptacle flat. Outer series of flowers pistillate and apetalous; innermost flowers perfect but sterile, the corolla 4-toothed. Achenes obcompressed, callous-margined or winged and pointed with the hardened persistent style. Pappus none. (Dr. Salvador Soliva of Spain.)

1. *S. sessilis* R. & P. Plants 2 to 4 in. across, minutely pubescent or rusty villous; one, two or three heads sessile at the very base, the somewhat tortuous stems radiating from under these; involueral bracts 7 or 8, oblong, acute, pilose-pubescent; pistillate flowers 9 to 12; each wing of the achene terminating above in an incurved tooth; staminate flowers fewer than the pistillate, 7 to 9; styles stout, subulate, conspicuously exerted beyond the disk-corolla.

Moist ground: Mendocino Co.; Howell Mt.; Oakland; Santa Cruz Mts.; Santa Barbara. Probably naturalized from Chile. Mar.-May.

TRIBE 5. Helenieae. SNEEZEWEED TRIBE.

36. JAUMEA Pers.

Perennial glabrous herbs. Leaves linear, entire, fleshy, opposite and connate at base. Heads middle-sized, many-flowered, solitary, terminating the branches, the peduncles thickened at apex. Flowers yellow, the rays pistillate, all fertile. Involucre cylindraceous-campanulate, its bracts broad and imbricated, the outermost short and fleshy. Receptacle naked, conical. Corolla glabrous. Style-branches of the disk-flowers thickened upward and papillose. Achenes linear, striately 10-nerved. Pappus (in ours) none. (I. H. Jaume St. Hilaire, French botanist.)

1. *J. carnosa* (Less.) Gray. Stems slender but rather rigid, many from the fleshy crown of the taproot, mostly simple, 4 to 6 in. long, decumbent at base and rooting at the nodes; leaves semi-terete, $\frac{3}{4}$ to 1 in. long; heads $\frac{1}{2}$ in. high; rays about 6.

Salt marshes about San Francisco and Suisun bays; beaches along the California coast and north to British Columbia. June-Oct.

37. LASTHENIA Cass.

Glabrous slightly succulent annuals. Leaves opposite, entire, sessile and more or less connate at base. Heads on slender peduncles. Flowers yellow, with 5 to 15 rays. Bracts of the involucre more or less united into a hemispherical or campanulate toothed cup. Receptacle conical or subulate, covered with projecting points which bear the linear or linear-oblong flattened achenes. Pappus of 5 to 10 paleae or none. (Named for a Greek girl who attended the lectures of Plato in the garb of a man.)

Pappus none; rays conspicuous.

Bracts united only below the middle; tube of corolla short-hirsutulous...1. *L. conjugens*.
 Bracts united above the middle; tube of corolla nearly glabrous.....2. *L. glabrata*.
 Pappus of 5 to 10 paleae, 2 or 3 awn-pointed; rays very inconspicuous; bracts united above the middle.....3. *L. glaberrima*.

1. *L. conjugens* Greene. Succulent or sometimes slender, 5 to 12 in. high, pubescent with short scattered hairs; leaves narrowly linear, with linear segments, or merely toothed, or the lowest entire; involueral bracts united only toward the base; corolla-tube usually hirsutulous; achenes polished, less than 1 line long.

Subsaline fields in the Bay region: Antioch; Newark, etc. Apr.

2. *L. glabrata* Lindl. Usually branching above the base, 11 to 16 in. high; leaves linear and entire or sometimes the upper pair broadly lanceolate and toothed, conspicuously connate and sheath-like at base; peduncles elongated,

erect; involucre broadly hemispherical; ligules about 5 lines long, the entire head $\frac{3}{4}$ to 1 in. wide.

Borders of salt marshes. Var. CALIFORNICA Jepson. Leaves less or scarcely at all connate; peduncles corymbose.—Plains and low hills. May.

3. *L. glaberrima* DC. Stems ascending, simple, 5 to 14 in. long; leaves linear, entire; heads on short peduncles, nodding in the bud, about 3 lines broad, seemingly rayless, the rays very small and inconspicuous; involucre with about 15 short teeth; corollas all shorter than their achenes; achenes minutely puberulent; pappus of 5 to 10 rigid paleae, 2 or 3 of them subulate-pointed or short-awned, the others erose or lacinate; achenes with short stiff hairs.

Half-aquatic in winter pools or in wet fields: near the coast and eastward to Alvarado and Mt. Diablo. May-June.

38. BAERIA F. & M. GOLD FIELDS.

Low and mostly slender annuals (except no. 10). Herbage commonly pubescent but never hoary. Leaves opposite, linear and entire, or lacinate-pinnatifid. Flowers yellow, the heads on slender peduncles. Rays 5 to 15, showy for the size of the heads, or sometimes very short. Involucre campanulate or hemispherical, its bracts as many as the rays, ovate or oblong and becoming more or less carinate below the middle. Receptacle subulate-conical. Achenes linear but somewhat broadened upward. Pappus of paleae or awns or both or none. (The Russian zoologist, Baer.)

1. *Pappus of one or more awns and several blunt paleae, usually alternating, sometimes wholly wanting in the same species; pubescence soft-hairy or none; at least some of the leaves pinnatifid or toothed.*

Insular species.....1. *B. maritima*.
Mainland species.

Plants slender.

Pappus-awns usually 4.....2. *B. fremontii*.

Pappus-awns usually 2.....3. *B. tenella*.

Plants stoutish; leaves broadly ligulate with few or several salient linear lobes.....4. *B. uliginosa*.

2. *Pappus uniform, paleaceous; pubescence as in the last section; leaves entire or pinnatifid.*

Involucre campanulate or hemispherical; rays conspicuous.

Leaves filiform and entire; salt marsh species.....5. *B. carnosa*.

Some leaves pinnatifid; alkaline plains.....6. *B. platycarpa*.

Involucres very narrowly cylindrical; rays so short that the heads are seemingly rayless; leaves very narrow, entire.....7. *B. microglossa*.

3. *Pappus uniform, of awn-like paleae or bristles; pubescence hirsutulous; leaves entire or often serrate in no. 10.*

Annuals.

Pappus usually none.....8. *B. chrysostoma*.

Pappus usually present, the awns paleaceous at base.....9. *B. hirsutula*.

Perennial; nearly simple; peduncles 4 to 8 in. long; pappus none or present.....10. *B. macrantha*.

1. *B. maritima* Gray. Stoutish, branching, 3 or 4 in. high, slightly villous, especially on the margins of the involucreal bracts; leaves linear or oblong-linear, entire or some sparingly toothed; rays 6 to 8, short and broad; pappus of 3 to 5 slender awns, with intervening lacinate paleae; achenes appressed-pubescent with short hairs.

Farallone Islands.

2. *B. fremontii* (Benth.) Gray. Erect, slender, 7 to 13 in. high; herbage nearly glabrous below, rather finely pubescent on the peduncles and involucre, or the involucre nearly canescent; leaves narrowly linear and entire, or mostly parted into linear lobes; involucre broad, its bracts 10 to 12, broadly

ovate; rays as many or fewer, with oval ligules shorter than the width of the disk; pappus of about 4 slender awns and as many or more numerous very small paleae, or seldom none.

Plains from Solano Co. southward. Mar.-Apr. Involucres nearly canescent.

3. *B. tenella* (Nutt.) Gray. Erect, sparingly branching, 5 to 8 in. high, somewhat canescent; leaves linear and entire or some of the lowest lacinate; rays 6 to 8, oval or oblong, little or not at all exceeding the disk; paleae and awns each usually 2 or often wanting.

Plains of eastern Contra Costa Co. Apr.-May.

4. *B. uliginosa* (Nutt.) Gray. At length loosely branched and diffuse, 9 to 12 in. high, villous-tomentose when young, commonly glabrate; leaves linear-ligulate, lacinate-pinnatifid (especially above the middle) or the upper sometimes entire, the larger 4 to 10 in. long, the undivided (or ligulate portion) often 4 lines broad and conspicuously nerved; involueral bracts and oblong exserted rays 10 to 13; awns 3 or 4, with about 6 short intervening paleae, or pappus sometimes none.

Low grounds, San Francisco Peninsula south to Santa Barbara. Apr.-June.

5. *B. carnosa* Greene. Stems about 9 in. high, simple or branched from the base, slender and wiry, very sparsely clothed with a fine deciduous wool; leaves somewhat succulent, all filiform and entire; bracts of involucre fleshy, about 7, with a single strongly earinate midrib; pappus of 4 or 5 ovate paleae, each bearing a subulate awn; achenes roughish.

Salt marshes at Vallejo, Greene. Too near the next.

6. *B. platycarpa* Gray. Stems purplish and wiry, branching 5 to 8 in. high; leaves narrowly linear, some pinnatifid into filiform divisions; bracts of the involucre 6 or 7, manifestly 3-nerved at base, the middle nerve at length carinately thickened; pappus-paleae bright white, 5 to 7, slender-awned, the awn as long as the achene.

Alkaline plains of the interior: Byron, etc. Apr.

7. *B. microglossa* (DC.) Greene. Very slender and but a few in. high; leaves scarcely 1 line wide, entire; heads few-flowered, very narrowly cylindrical, the rays very short and inconspicuous and thus apparently rayless; bracts of the involucre 3 or 4, narrowly oblong; achenes fusiform-linear; pappus-paleae 2 to 4, attenuate-subulate.

South Coast Range valleys: Mt. Diablo; San Francisco Bay and southward to Southern California.

8. *B. chrysostoma* F. & M. GOLD FIELDS. Stems slender, simple or freely branching, 5 to 11 in. high; herbage hirsutulous; leaves narrowly linear, 1 line wide or less, entire; heads 3 or 4 lines high; rays and bracts of the broad involucre 7 to 15, or in depauperate plants often fewer; ligules 3 or 4 lines long; achene linear-clavate, smooth and shining, or papillate; pappus typically none.

Lower foothills and valley plains, southward to Southern California and north to Southern Oregon. Everywhere abundant, often coloring leagues of interior hills. Var. *GRACILIS* Hall. Achenes linear, truncate, more or less strigose-pubescent; pappus of 3 or 4 awns from small lanceolate paleae, sometimes none.—Middle California to Southern California (*B. gracilis* Gray).

9. *B. hirsutula* Greene. Often branching very freely, 3 to 4 in. high, hirsute-pubescent; leaves broadly linear, often with saliently projecting teeth, the lower connate, sheathing the stem; involueral bracts obovoid, acutish; rays oblong; achenes compressed, scabrous with short sharp points; pappus of 2 to 5 brownish awn-like bristles or none.

Open hills near the sea: Pt. Lobos; Pt. Reyes, etc. May. Very similar in appearance to *B. maritima*.

10. *B. macrantha* Gray. Biennial with tuberous root, simple or nearly so, 7 to 18 in. high, the peduncles 4 to 8 in. long; leaves 2 to 6 in. long, 2 lines wide, more or less 3-nerved and obtuse, hispidly ciliate, at least toward the base, entire; head about $\frac{1}{2}$ in. high and 1 to $1\frac{1}{2}$ in. broad; involucre of about 12 hirsute-pubescent thickish herbaceous bracts; rays 5 to 8 lines long; pappus none or of 1 to 4 bristles.

Along the coast from Marin Co. to Mendocino Co. May-June. Specimens from Pt. Reyes, *Davy*, collected within the space of a few square feet show the following variations as to the pappus: Plant no. 1.—Pappus none. Plant no. 2.—Pappus none save one flower with a single pappus-bristle. Plant no. 3.—Pappus none, rudimentary (reduced to a minute scale) or with one good bristle. Plant no. 4.—Pappus of 2 or 3 or 4 (mostly 4) bristles. Other specimens show corresponding variations.

39. MONOLOPIA DC.

White-woolly annuals with alternate sessile entire or low-denticulate leaves and large peduncled heads of golden yellow flowers. Involucre hemispherical, its bracts united into a cup with broad or triangular teeth, or distinct to the base. Receptacle conical, naked. Rays with 3 or 4-toothed ligules and bearing at base and opposite the ligule an oblong or roundish denticulate appendage. Lobes of disk-corollas somewhat hairy. Achenes angular, black. Pappus none. (Greek mono, single, and lopus, husk, on account of the bracts of the involucre in one series.)

Bracts united into a toothed cup.....1. *M. major*.
Bracts distinct to the base.....2. *M. gracilens*.

1. *M. major* DC. Stoutish, simple or branching, 8 to 20 in. high; tomentum floccose and tardily deciduous; leaves mostly oblong-lanceolate, low-denticulate, or commonly entire, 4 in. long or less; bracts of the involucre united into a broadly campanulate cup (6 to 7 lines broad) with triangular teeth; rays 3 or 6 to 10 lines long.

Petaluma and the lower Sacramento Valley, and southward through the South Coast Ranges and the San Joaquin Valley to Southern California.

2. *M. gracilens* Gray. Slender, paniculately branched, 10 to 15 in. high; leaves narrowly oblong to linear-lanceolate, low-denticulate or entire; involucre 3 or 4 lines broad, its bracts distinct to the base; rays 2 or 3 lines long; achenes less than 1 line long.

Santa Cruz Mts. June.

40. ERIOPHYLLUM Lag.

Annual or perennial herbs or suffruticose plants. Herbage white-woolly, deciduous or floccose. Leaves alternate, divided or incised. Involucre oblong to hemispherical, its bracts distinctly rigid and permanently erect. Receptacle flat or convex. Rays 4 to 13 or 15, broad. Tube of disk-corolla commonly glandular and hairy. Achenes linear or cuneate-linear. Pappus of firm point-less paleae. (Greek erion, wool, and phullon, leaf, the herbage woolly.)

Suffruticose; heads small except no. 3.

Heads in close terminal clusters; involucre obovoid to oblong.

Rays 6 to 8.....1. *E. stachadifolium*.

Rays 4 or 5.....2. *E. confertiflorum*.

Heads peduncled in a loose corymb; involucre campanulate-hemispherical; rays 6 to 8.....3. *E. jepsonii*.
Herbaceous; heads larger, scattered on rather long peduncles; involucre hemispherical.

- Leaves broadish; coast species.....4. *E. arachnoideum*.
 Leaves narrower; interior species.
 Annual5. *E. idoneum*.
 Perennial6. *E. lanatum*.

1. *E. staechadifolium* Lag. LIZARD TAIL. Diffuse, 2 or 3 ft. high; leaves pinnately parted into 5 or 7 lobes, these again pinnately parted or toothed or entire, the margins revolute and the under surface white with a dense felt-like tomentum; upper surface of leaves green and the tomentum of the stems deciduous; heads 4 or 5 lines high, disposed in close compact corymbs; involucre broadly oblong or somewhat turbinate, bracts linear; rays 6 to 8; pappus-paleae 9 to 12, those at the angle of the achene longer.

Sandy hills and fields near the ocean: San Francisco to Santa Barbara. July-Sept.

2. *E. confertiflorum* (DC.) Gray. Stems $1\frac{1}{4}$ to 2 ft. high, often unbranched, with a close dense (at length deciduous) tomentum; flowering branches very leafy but the leaves small and ternately or pinnately parted into 3 to 7 narrowly linear divisions; heads $1\frac{1}{2}$ to 2 lines high, many in compact terminal clusters; involucre obovoid-oblong, its bracts about 5, ovate; rays 4 or 5, $1\frac{1}{2}$ to 2 lines long; paleae 8 to 10, nearly equal, about $\frac{1}{2}$ as long as the achene.

Hill and mountain summits of the Coast Ranges and south to Southern California. June-July. Var. *DISCOIDEUM* Greene, from Sonoma Co., is rayless.

3. *E. jepsonii* Greene. Bushy, 2 ft. high; stems white with tomentum, the leaves soon green or greenish; leaves pinnately divided into 5 to 7 narrowly linear lobes; heads 3 to 4 lines high, peduncled in a loose corymb; involucre broadly campanulate-hemispherical, its bracts 6 to 8, ovate; rays elliptical or oblong, 4 lines long, ovate; achenes hispidulous; pappus-paleae in two unequal series, those of the inner set exceeding the outer.

Mt. Hamilton Range between Arroyo Mocho and Arroyo Valle. May.

4. *E. arachnoideum* (F. & M.) Greene. Much branched, decumbent at base, 1 ft. high or more; tomentum deciduous or becoming thin on the under surface of the leaves; leaves broadish (at least some of them 1 in. broad), cleft into 3 to 5 triangular or oblong lobes or variously incised or toothed; involucre hemispherical, its bracts oblong or oblong-ovate, acute; rays 10 to 13, 4 or 5 lines long; pappus-paleae short.—(*E. caespitosum* var. *latifolium* Gray.)

Mountains towards the coast: Marin Co., south to Santa Cruz and north to Humboldt Co. May-June.

5. *E. idoneum* Jepson. Annual, branching from the base, 12 to 16 (or 30) in. high, the herbage at first woolly, later deciduous and floccose; leaves mostly basal, linear-spatulate or obovate in outline, lacinate or pinnatifid, green above, the tomentum mostly persistent on the under surface; heads solitary on long naked peduncles or the heads somewhat corymbosely clustered and the peduncles shorter; involucre hemispherical, 3 or 4 lines high, its bracts broadly lanceolate, appearing as if united or connivent by reason of the dense felt-like tomentum; rays 9 to 12; ligules elliptic, 5 to 6 lines long, sharply notched at summit, with a small tooth in the notch; pappus-paleae about 9, very short.

Vaca Mts.; Napa Co. hills. May-June.

6. *E. lanatum* (Pursh) Forbes var. *grandiflorum* (Gray) Jepson. White-woolly, the tomentum tardily deciduous, 1 or 2 ft. high; leaves ovate or obovate in outline, pinnately divided into narrow toothed or pinnatifid segments; peduncles long and naked; involucre broadly hemispherical (8 lines broad); rays about 11, $\frac{1}{2}$ in. long and over one-half as wide.

Lowest foothills of the inner Coast Range in Solano Co.; Sierra Nevada foothills. May-June.

41. RIGIOPAPPUS Gray.

Slender annual with alternate very narrowly linear entire leaves. Heads small, solitary on the simple stems or on the branches, which are often proliferous. Receptacle flat, naked. Bracts subulate, similar to the upper leaves. Flowers yellow. Ray-corollas not exceeding the disk, the ligule not longer than the tube. Disk-corollas small, with 3 to 5 short erect teeth. Pappus in disk and ray of 3 to 5 subulate awns. Achenes linear. (Greek rigios, stiff, and pappos, pappus.)

1. *R. leptocladus* Gray. Three or 4 to 10 in. high, the herbage short-hairy or nearly glabrous; branches filiform; heads 3 lines high; achenes hispidulous.

Wooded hills: Antioch; North Coast Ranges; Tehama Co.; Sierra Nevada foothills. June.

42. CHAENACTIS DC.

Ours annual with alternate pinnately parted or dissected leaves and yellow flowers. Heads peduncled, solitary or cymosely arranged. Bracts of the campanulate involucre herbaceous, linear, equal, in one series. Receptacle flat, naked. Corollas with short tube and long throat, or the marginal corollas in some species with the limb palmately enlarged, forming a kind of ray. Pappus of hyaline paleae, the paleae in the outer flowers commonly shorter and fewer. (Greek chaino, to gape, and aktis, ray, in reference to the marginal flowers of one section of the genus.)

Paleae of the disk-flowers 4, equal1. *C. glabriuscula*.
Paleae of the disk-flowers 5, unequal2. *C. gracilentia*.

1. *C. glabriuscula* DC. Five to 11 (or 19) in. high, thinly floccose, at length glabrous; leaves pinnately parted into narrowly linear lobes or the uppermost linear and merely toothed or entire; heads 5 to 7 lines high; bracts of the involucre thickish; marginal corollas ample, much longer than those of the disk; pappus-paleae 4, oblong-lanceolate, those of the disk equal, of the marginal achenes with 1 long and 3 short ones; short paleae of the ray relatively broader or even elliptical.

Antioch; Sierra Nevada foothills; Coast Range foothills west of Red Bluff. Apr. Var. *LANOSA* Hall. Stems leafy only at the branching base, bearing many long peduncles which are naked and scape-like; herbage whitish with floccose wool which is later deciduous; leaves thickish, simply pinnate with few narrowly linear and mostly short lobes or the upper entire; pappus-paleae 4, sometimes 5, equal or nearly equal, narrowly oblong or oblong-lanceolate, acutish.—Monterey Co. and southward to Southern California; reported from the lower San Joaquin.—(*C. lanosa* DC.) Var. *HETEROCARPHA* Hall. Three-fourths to 1½ ft. high, with corymbose peduncles or often simple and 1-headed; herbage hoary-tomentose but soon glabrous; leaves pinnately or bipinnately parted, the lobes short, unequal, crowded; heads 6 lines high on long peduncles; marginal corollas conspicuously enlarged, surpassing the disk; pappus of disk-achenes of 4 elliptic-oblong paleae equaling the corolla and of two or more roundish and shorter outer ones; paleae of marginal flowers much shorter.—Lake Co.; upper Sacramento Valley; Sierra Nevada.—(*C. heterocarpa* Gray.)

2. *C. gracilentia* Greene. Simple below, corymbosely branching above, 7 or 8 in. high; leaves 1 or 2 in. long, with narrowly linear rachis bearing oblong lobes (1 line long) or short teeth; heads 3 or 4 lines high; marginal corollas little amplate; achenes black, sparingly hispidulous with white hairs; pappus-

paleae commonly 5, unequal, oblong-oblancoelate, $\frac{1}{2}$ to $\frac{1}{4}$ as long as the achene, with 2 very small roundish outer ones.

Dry ridges east of Napa Valley. June.

C. DOUGLASHI H. & A. Corollas whitish or flesh-colored, the marginal not larger; paleae 8 to 14, narrowly oblong.—Sierra Nevada.

C. NEVADENSIS Gray. Low tufted perennial, 2 to 4 in. high; peduncles 1 in. or less long, 1-headed.—High Sierra Nevada.

43. HELENIUM L. SNEEZEWEED.

Erect perennial herbs with resinous-dotted herbage. Leaves alternate, sessile except the lower, and often decurrent on the stem. Heads solitary or corymbose, borne on long naked peduncles. Flowers yellow, or the lobes of the disk-corolla turning yellowish or brownish. Rays several, usually drooping. Bracts of the involucre linear, reflexed. Receptacle globose or hemispherical, naked. Achenes turbinate, ribbed. Pappus of 5 to 12 thin or hyaline paleae, in ours short-pointed. (Greek name of some plant, perhaps named after Helenus, son of Priam.)

Rays shorter than the disk, 3 to 5 lines long.....1. *H. puberulum*.
Rays as long or longer than the disk, 7 to 9 lines long.....2. *H. bigelovii*.

1. *H. puberulum* DC. ROSILLA. Paniculately branched, 2 to 5 ft. high, the branches ending in long slender peduncles; herbage puberulent; leaves lanceolate or narrowly linear or the longest oblong, sessile and strongly decurrent on the stem; globose disk of flowers 5 to 7 lines broad; rays and bracts of the involucre reflexed, short and inconspicuous; disk-flowers red-brown; scales of pappus ovate, short-awned.

Creek beds, stream banks and about springy places: Humboldt Co.; Vaca Valley; San Francisco; San Jose; Loma Prieta; Monterey and southward to Southern California. July-Nov.

2. *H. bigelovii* Gray. BIGELOW SNEEZEWEED. Stem 2 to 4 ft. high, branching above into several erect peduncle-like branches; leaves lanceolate, thickish, 9 in. long or less, minutely tomentose, not so conspicuously decurrent as in the preceding; rays showy, golden yellow, 7 to 9 lines long; disk brownish yellow; pappus-paleae 5 to 8, ovate-lanceolate, tapering into a slender awn; achenes hairy.

Marshy ground: Lake Co. and Santa Rosa Creek to Southern California.

44. BLENNOSPERMA Less.

Low annual herbs with alternate pinnately parted leaves and peduncle-like branches bearing solitary yellow flowers. Involucre simple, parted into broadly oblong bracts. Receptacle naked. Heads many-flowered. Ray-flowers fertile; disk-flowers perfect but sterile. Achenes obovate, not compressed or angled, densely covered with minute papillae. Pappus none. (Greek blenna, mucus, and sperma, seed, the surface of the achene becoming conspicuously mucilaginous when moistened.)

1. *B. californicum* (DC.) T. & G. Stems branching from near the base, becoming diffuse, 4 to 6 in. high, often naked above; herbage glabrous, slightly succulent; leaves parted into narrowly linear remote lobes; involucre greenish with purple markings; ray-flowers 8 to 11, the ligule of the corolla 2 to 3 lines long, or the alternate pistils destitute of corolla; style-branches of ray-flowers broad; disk-flowers 20 to 45, shorter than the involucre, their styles undivided, capitate at summit; achenes obscurely 8 to 10 ribbed.

Not infrequent in moist ground, from the upper Sacramento Valley to Southern California; Ukiah; Sonoma Co.; Solano Co.; Antioch; Danville; Livermore Pass. Feb.-Mar.

TRIBE 6. **Madieae.** TARWEED TRIBE.

45. **MADIA** Mol. TARWEED.

Glandular-viscid heavy-scented erect annual or perennial herbs. Leaves, at least the upper, alternate, entire or serrate. Heads axillary and terminal. Flowers yellow, opening in the evening and closing before noon of the next day. Involucre angled by the salient carinate or almost conduplicate bracts; bracts in 1 series, completely enfolding the laterally compressed ray-achenes, and with free moderately long or short tips. Receptacle flat or convex, bearing a single row of chaffy bracts between ray- and disk-flowers and often united and forming a cup. Disk-corollas in ours pubescent. Rays few to many, 3-lobed. Bracts of involucre deciduous with the mature ray-achenes, these beakless (except in no. 5). Disk-achenes fertile or abortive. (Madi, the Chilian name.)

A. Receptacle glabrous; annuals except no. 4.

Achenes beakless.

Rays very short and inconspicuous; achenes of ray curved; pappus none.

Plants stoutish and viscid-glandular; heads in clusters.

Herbage ill-scented.....1. *M. sativa*.

Herbage honey-scented.....2. *M. capitata*.

Plants slender and moderately glandular; heads scattered.....3. *M. dissitiflora*.

Rays showy; achenes of ray incurved; leaves some or mostly opposite; pappus present...

4. *M. madioides*.

Achenes with a minute reflexed beak; rays $\frac{1}{2}$ in. long; pappus none.....5. *M. radiata*.

B. Receptacle filimbriate-hirsute; annuals.

Achenes beakless, those of the ray not incurved; pappus none; rays showy.....

6. *M. elegans*.

1. **M. sativa** Molina. CHILE TARWEED. Robust, 1 to 4 ft. high, pubescent with slender hairs and beset with pedicellate very viscid glands, ill-scented; leaves from broadly lanceolate to linear; heads 5 to 6 lines high, short-peduncled or sessile, disposed in the upper axils and at the ends of short branches; bracts of involucre hispid; rays 5 to 12, with pale yellow ligules about 2 lines long; cup of receptacle campanulate and enclosing many disk-achenes, these cuneate-oblong and 4-angled, prominently 1-nerved on the sides and 2 lines long; ray-achenes somewhat falcate-obovate, either with or without an obvious nerve on the sides.

Common in vacant lots, waysides, etc., about San Francisco Bay. Doubtless naturalized from Chile. July-Aug.

2. **M. capitata** Nutt. NUTTALL TARWEED. Erect, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, simple or branching; herbage very viscid-glandular, honey-scented; leaves linear; heads somewhat longer than in the preceding, capitate-congested at the ends of the branches; bracts of involucre short-bristly; cup of receptacle narrow and nearly closed, containing very few to many achenes; bracts of involucre and achenes semi-persistent.

North Coast Ranges; South Coast Ranges (Gilroy, Santa Cruz).

3. **M. dissitiflora** (Nutt.) T. & G. GUM-WEED. Very slender, 1 to 2 ft. high, simple or loosely branching, moderately or scarcely at all viscid, at least below; flowers sulphur-yellow; heads 3 (or barely 4) lines high, scattered or loosely paniculate; cup of receptacle ovoid but not closed, containing few disk-flowers; rays 5 to 8, $1\frac{1}{2}$ to 2 lines long; achenes short and broad (1 to 2 lines long).

Stream banks, open bushy places or wooded slopes in the mountains: North Coast Ranges to the Santa Cruz Mts. (where very slender forms pass into coarser forms, as much as $3\frac{1}{2}$ ft. high, by every gradation), and Southern California.

Var. *anomala* Jepson, n. comb. Chaffy bracts of receptacle not joined into a cup, enclosing 3 flowers only; achenes all gibbously obovate, those of the rays 3 to 5.—Marin Co. (*M. capitata* var. *anomala* Jepson.)

4. *M. madioides* (Nutt.) Greene. WOODLAND MADIA. Perennial (or sometimes biennial?); stem or stems from the base simple, bearing a terminal corymbose panicle of long slender and nearly naked branches, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high; some or most of the leaves opposite, linear, a few varying to lanceolate, 4 in. long or less, entire or sparingly denticulate; bracts of the involucre 8 to 12, with short tips; rays acutely 3-lobed, 3 or 4 lines long; only ray-achenes fertile, these much flattened, curved and somewhat obovate, the surface covered with minute muriculations and the sides with many striae; pappus of very short fimbriate or hairy paleae.—(*M. nuttallii* Gray.)

Wooded country near the coast from Monterey to Mt. Tamalpais, Bolinas Ridge and northward. June.

5. *M. radiata* Kellogg. Stem stout, 2 to 3 ft. high; hirsute and viscid; larger leaves broadly lanceolate, denticulate; bracts of the involucre 10 to 20, with short tips; rays light yellow, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, obtusely 3-toothed; chaffy bracts between ray and disk united; disk-flowers very numerous on a nearly flat glabrous receptacle, fertile, except the central ones, somewhat clavate and 4-angular; ray-achenes narrowly obovate-falcate, flat, tipped with a minute reflexed beak.

Near the mouth of the San Joaquin River.

6. *M. elegans* Don. COMMON MADIA. Stem 1 to 3 ft. high; lower leaves linear, 3 to 8 in. long, short-hirsute, often densely so; upper leaves much reduced in size, linear-lanceolate; herbage, particularly above, viscid with short gland-tipped hairs, the involucre and peduncles more or less hirsute with white hairs; heads many in a corymbose panicle; receptacle convex, fimbriate-hirsute; rays 12 to 15, $\frac{1}{3}$ to nearly 1 in. long, yellow or with a red spot at base; achenes flattish, light brown or blackish, smooth.

Variable and abundant species found on dry hillsides and in valley fields. July-Oct. Var. *DENSIFOLIA* Jepson, leaves crowded toward the base or tufted.

46. HARPAECARPUS Nutt.

Small slender viscid-glandular annual with sweet-scented herbage and narrow entire mostly alternate leaves. Head small, few-flowered, borne on naked filiform peduncles. Flowers yellow; corolla glabrous. Ray-flowers 4 to 8, the ligules minute. Disk-flower 1, the bracts of the receptacle united and forming an enclosing cup, the receptacle otherwise naked. Achenes slender, laterally compressed. Pappus none. (Greek harpe, a sickle, and karpus, fruit, on account of the shape of the ray-achenes.)

1. *H. exiguus* Gray. Paniculately branched, commonly 4 to 6 in. high, the leaves narrowly linear; heads $1\frac{1}{2}$ to 2 lines long; bracts of the involucre 4 to 8, lunate and strongly carinate, the free tip scarcely any, very hispid-glandular; ray-achenes obovate-lunate, pointed by a small disk.—(*Madia filipes* Gray.)

Open brush or woods in the mountains of the Coast Ranges: northern California; Napa Range; Cazadero; Oakland Hills; Pajaro Hills, southward to Southern California, northward to British Columbia.

HEMIZONELLA Gray. Near *Harpaecarpus* but the leaves mainly opposite; disk-flowers solitary or rarely 2 to 4; rays minute. *H. PARVULA* Gray. Much branched, 2 or 3 in. high; heads sessile or on slender peduncles; achenes tipped with an incurved beak.—Sierra Nevada; Mendocino Co. *H. MINIMA* Gray. One in. high; achenes beakless.—Sierra Nevada.

47. **HEMIZONIA** DC. TARWEED.

Viscid-glandular and ill-scented annuals with alternate (or the lowest sometimes opposite) narrow leaves. Flowers yellow or white, in mostly numerous heads. Disk-flowers surrounded by a circle of chaffy and often slightly united bracts or the disk chaffy throughout. Receptacle flat, its bracts deciduous. Ray-achenes thick, short, turgid, half enclosed by the lower part of the bract of the involucre which falls with it or is at least deciduous. Disk-achenes sterile, with or without pappus. This and the two following genera were perhaps better received as one. (Greek hemi, half, and zonia, zone, the bracts but half enclosing the fruit.)

A. Ray-achenes not beaked.

Receptacle with chaffy bracts throughout; areola of ray-achenes nearly or quite central at the summit of the achene; disk-achenes without pappus; flowers white, sometimes yellow.

Rays scarcely surpassing the bracts of the involucre.....1. *H. congesta*.
Rays showy, much surpassing the bracts of the involucre.

Heads paniculate or corymbose.....2. *H. luzulaefolia*.

Heads racemously disposed along simple branches.....3. *H. clevelandii*.

B. Ray-achenes beaked.

Receptacle with a circle of bracts surrounding disk-flowers, otherwise naked; leaves without truncate glands; flowers yellow.

Rays 12 to 25; pappus minute or none; heads hemispherical.....4. *H. corymbosa*.

Rays 5; pappus of linear paleae; heads very narrow.

Heads on slender pedicels.....5. *H. kelloggii*.

Heads fascicled in small clusters.....6. *H. fasciculata*.

Receptacle with chaffy bracts throughout; leaves of the branchlets with small truncate glands at tip; pappus none.

Rays 4 or 5; leaves crowded on the branchlets.....7. *H. virgata*.

Rays 5 to 8; leaves scattered on the branchlets.....8. *H. heermannii*.

1. *H. congesta* DC. Soft-hirsute or villous, the inflorescence slightly glandular; lowest leaves commonly opposite, oblanceolate, sparsely serrulate, the upper linear or linear-lanceolate and entire; heads terminating paniculate or corymbose branches; bracts of the involucre with lanceolate foliaceous tips, which are little surpassed by the rays; outer bracts of the receptacle either lightly connate or nearly distinct; achenes with conspicuous inflexed stipe.

First collected by Douglas "in California," doubtless between Monterey and Sonoma; attributed by Greene to Marin Co., etc.

2. *H. luzulaefolia* DC. HAY-FIELD TARWEED. Whole plant excepting the lowest leaves very glandular and ill-scented; stems erect, 1 to 2 ft. high, corymbosely or paniculately branched at summit, or branching more freely and diffuse; lower leaves crowded and more or less tufted, narrowly linear, mostly tapering somewhat to the apex, 3 to 5 in. long, 1 or 3-nerved, canescent with appressed soft silky hairs which are more or less floccose-deciduous; upper leaves much reduced; heads numerous, on short peduncles, which are nearly naked or bear very much reduced leaves; tips of the involucre bracts acute or obtuse; outer bracts of the receptacle united into a cup; rays 6 to 10, white or pink-tinged; achenes with very short stipe.

Abundant in mowed hay fields and pasture lands: Sacramento and San Joaquin valleys and westward through the Coast Range hills and valleys to the ocean. July-Oct. Var. *LUTESCENS* Greene. Flowers yellow.—Fields near San Francisco Bay, in Contra Costa, Napa, and Marin cos. Var. *CITRINA* Jepson. Lowest leaves glandular-pubescent, without appressed woolly hairs; flowers lemon-yellow.—Northern Marin Co. Apr.-May.

3. *H. clevelandii* Greene. General habit of the preceding, but the herbage much less glandular; involucre white-hairy toward the base; heads disposed to be racemose on the branches as well as terminal.

North Coast Ranges from Calistoga, *Greene*, 1883, to Clear Lake, *Bolander*. Rarely collected.

4. *H. corymbosa* (DC.) T. & G. COAST TARWEED. Corymbosely and widely branching, 1 to 1½ ft. high, hirsute-pubescent and glandular; radical and often some lower leaves pinnately divided into linear lobes, the upper and those of the flowering branches linear and entire; heads ½ in. high, 7 to 10 lines broad; rays 12 to 25, oblong-cuncate, 2 to 4 lines long, 3 or 4-toothed; pappus of the sterile disk-achenes of minute fimbriate-bristly scales, or of entire scales, or none; ray-achenes with a short upturned beak on the inner side at apex.—(*H. angustifolia* DC.)

Abundant in valley fields and on hillsides: Berkeley to Santa Cruz and Monterey Co. June-July.

5. *H. kelloggii* Greene. Erect, paniculately branching, 1½ to 2½ ft. high, the heads on slender pedicels; herbage mostly hispid below and glandular above; leaves linear and entire, those of the filiform flowering branchlets very short; lower leaves pinnately parted; heads narrow; disk-flowers about 6 or 7; ray-flowers 5, the ligules 2 to 2½ lines long; ray-achenes slightly curved, roughened on the beak and sides, and with a curved or upturned beak at the summit on the inner side; pappus of about 9 linear paleae which are irregularly lacerate at summit and almost or quite as long as the tube of the corolla, united only at base or almost to the summit.

Antioch to the San Joaquin Valley where it is abundant in low grain fields near the river. July-Aug.

6. *H. fasciculata* (DC.) T. & G. Paniculately branched above the base, ¾ to 2 ft. high, sparsely hirsute and hispid, or disposed to be nearly glabrous above; radical leaves pinnately parted; stem leaves linear, either lacinate-pinnatifid, few-toothed or entire, those of the branchlets shorter and mostly entire; heads usually fasciated in rather dense small clusters; bracts of the involucre glabrous or glandular-hispidulous, those of the involucre slightly united; disk-achenes with a pappus of 6 to 10 linear paleae lacerate at tip; ray-achenes smoothish or transversely rugose, with a very short beak.

Mt. Diablo Range southward to Monterey Co. and Southern California.

7. *H. virgata* Gray. Stem commonly branching at the middle into several virgate branches bearing numerous racemously disposed heads on short lateral branchlets; herbage glabrous or nearly so; branchlets crowded with linear leaves about 1 line long, those (particularly of the flowering branchlets) ending in a truncate or somewhat saucer-shaped gland; involucre oblong, its bracts 5, with involute tip ending in a truncate gland and stipitate-glandular on the back; ray-flowers 4 or 5; disk-flowers 7 to 10.

Common on the plains of the Sacramento Valley (Suisun, Vanden, Galt, etc.) and the San Joaquin Valley and in the valleys of the inner South Coast Ranges. Southern California. Aug.-Oct.

8. *H. heernannii* Greene. Stems paniculately branched, 1 to 3 ft. high; herbage viscid, pubescent, heavy-scented; leaves of the flowering branchlets minute, scattered; involucre hemispherical, its bracts beset with stalked glands; ray-flowers 5 to 8, disk-flowers 10 to 15; ray-achenes with a somewhat conspicuous beak and stipe.

Mt. Diablo Range southward to Kern and Ventura cos.

48. HOLOCARPHA Greene.

Corymbosely branching annual with very viscid-glandular herbage. Leaves of the axillary fascicles and those about the heads narrowly linear, beset with

stipitate glands and tipped with a truncate gland. Heads solitary or commonly glomerate at the ends of the branches. Bracts of the convex receptacle each subtending a flower, the outer and those of the involucre abundantly covered with slender or clavate colorless gland-tipped processes. Ray-flowers many, with short yellow ligules; achenes 4-ridged on back, the ventral angle ending in a beak. Disk-flowers with sterile achenes. Pappus none. (Greek holos, whole, and karphe, chaff, the whole receptacle chaffy.)

1. *H. macradenia* (DC.) Greene. Branching from above the base, about 1 ft. high; herbage unpleasantly odorous; lower leaves linear-oblong, lacinate; heads $\frac{1}{2}$ in. broad.

Low dry fields about San Francisco Bay. At one time abundant in the fields of South Berkeley. Aug.-Sept. Connects *Hemizonia* with *Centromadia* too intimately.

49. CENTROMADIA Greene. SPIKEWEED.

Rigidly branching annuals with alternate spinescent leaves and involueral bracts, the lower pinnatifid, the upper entire. Herbage more or less glandular and scented. Flowers yellow, with 25 to 40 small bifid rays. Receptacle with chaffy bracts throughout, none of the outer united or connate. Disk-achenes chiefly sterile, with or without narrowly linear or bristle-like paleae. Ray-achenes more or less triangular, smooth or roughish on the back, the inner terminated by an erect beak-like apiculation. (Greek kentron, a prick, and Madia, an allied genus.)

Herbage yellowish green, sparsely hirsute, sweet- or honey-scented; floral leaves little or not all surpassing the heads.....1. *C. pungens*.

Herbage dark, rather densely villous-hirsute, ill-scented; floral leaves often conspicuously surpassing the heads.....2. *C. fitchii*.

1. *C. pungens* (H. & A.) Greene. COMMON SPIKEWEED. Herbage sparsely hirsute or hispid with spreading hairs, hardly viscid or glandular; stems rigidly and freely branching, commonly from near the base, sometimes only above, 1 to 2 or 3 feet high; leaves (especially of the flowering branches) linear-subulate, spinose, entire, the lower and lowest pinnately parted into oblong lobes, or pinnatifid, the lobes or teeth spinosely or pungently tipped; bracts of the receptacle cuspidate; pappus of disk none; ray-achenes roughish, somewhat laterally 2-nerved on back.—(*Hemizonia pungens* T. & G.)

Abundant on the plains of the lower San Joaquin, southward to Southern California and westward to Walnut Creek and Alameda. On the alkaline plains of the upper San Joaquin this species covers tens of thousands of acres and often forms thickets 4 or 5 ft. high. It is a valued bee plant. Var. *PARRYI* Jepson. Minutely glandular; bracts of receptacle thin, not pungent; disk-achenes with 3 to 5 slender almost bristle-like paleae as long as the corolla; ray-achenes semi-obcordate in outline.—*Calistoga*; Vacaville (= *C. rudis* Greene, the achenes either smooth or rough warty); Southern California. It is abundant in low more or less alkaline lands on the plains of Solano Co. and forms extensive colonies in summer fields; extermination is often accomplished by means of bands of sheep which leave the fields perfectly clean and destitute of this Spikeweed pest.

2. *C. fitchii* (Gray) Greene. FITCH'S SPIKEWEED. Diffusely branched from above or at the base, 9 to 16 in. high, the herbage hirsute or villous with spreading hairs; leaves of the radical tuft pinnately parted into remote narrowly linear pungent lobes; cauline leaves linear and entire, tapering into a subulate or pungent tip, those about the head spreading and star-like, mostly all bearing stipitate glands; bracts of the involucre subulate, those of the recep-

tales pointless, soft, hairy; ray-achenes flattened laterally, nearly semi-circular in outline, smooth; pappus of disk-achenes of 9 to 11 linear paleae as long as the corolla and hairy and fimbriate at the tip.—(*Hemizonia fitchii* Gray.)

High sandy land in the valleys and foothills: Sierra Nevada foothills and the lower San Joaquin northward through the Sacramento Valley and westward to Napa, Sonoma and Mendocino cos. Aug-Sept.

50. CALYCADENIA DC. ROSIN WEED.

Erect annuals, hirsute or hispid or almost glabrous. Stems simple, or with virgate branches, or repeatedly branched. Leaves all entire, narrowly linear, becoming filiform by revolution of the margins, at least those near the heads and those of the fascicles in the axils bearing at apex tack-shaped or saucer-shaped glands. Heads oblong or narrow. Flowers white or yellow. Ray-flowers few (1 to 5 or 8), the ligules broad and palmately 3-lobed or -parted; ray-achenes obovoid-triangular, the areola at summit quite or nearly in the center; pappus none. Disk-flowers surrounded by a circle of bracts connate into a cup, or at length separating; disk-achenes with conspicuous paleaceous pappus. (Greek kalux, covering, and adenos, a gland, on account of the glands on the involucre.)

Rays 5 to 8; flowers yellow; plants for the most part very glabrous.....1. *C. truncata*.
Rays 1 to 5.

Flowers white or reddish-tinged.

Stems repeatedly branched; branches filiform.....2. *C. pauciflora*.

Stems simple or with virgate branches.

Pappus-paleae unequal; floral leaves not truncate.....3. *C. multiglandulosa*.

Pappus-paleae subequal; floral leaves truncate.....4. *C. spicata*.

Flowers yellow; stems simple.....5. *C. hispida*.

1. *C. truncata* DC. ROSIN WEED. Stems 1 to 3 ft. high, reddish brown, simple below, branching below, branching above into a panicle of long straight slender branches along which the heads are scattered; herbage glabrous or the linear and entire leaves somewhat hirsute-ciliate; smaller leaves with subsessile glands at apex; heads oval, 4 or 5 lines long; rays 5 to 8, broad, 4 to 5 lines long; ray-achenes glabrous, triangular, roughish and enclosed in boat-shaped bracts; bracts of the receptacle lightly cohering to the top into a cup, separating in age; disk-flowers 10 to 20; pappus of 7 to 10 unequal oblong fimbriate paleae shorter than the achene, or rarely obsolete.—(*Hemizonia truncata* Gray.)

Marin and Napa cos. northward to Shasta Co., thence southward in the Sierra Nevada to El Dorado Co.

2. *C. pauciflora* Gray. Branching freely, 10 to 18 in. high, the branches diverging or zigzag and filiform; herbage sparingly hairy and leaves (particularly about the heads or of the axillary fascicles) stipitate-glandular; heads oblong, scattered along the branches (subsessile in the axils or forks, as well as terminal), always solitary; flowers white or rose-tinged; rays 1 or 2, 3-parted; disk-flowers 3, contained in a 3-lobed cup; pappus of 5 subulate-awned paleae and 5 small truncate paleae; ray-achene glabrous.—(*Hemizonia pauciflora* Gray.)

Mountain sides of the inner North Coast Range from the Vaca Mts. northward to the Clear Lake region. July-Aug.

3. *C. multiglandulosa* DC. Sparingly hirsute or hispid, especially toward the base of the leaves, 6 to 11 (or 16) in. high; herbage with a pleasant balsamic odor, the floral leaves and involucre glandular with stipitate glands; leaves filiform-linear, mostly straight and rigid but brittle, the upper somewhat divaricately spreading and mostly 2 or 3 times longer than the heads and floral leaves in the axils; heads solitary in the axils or crowded towards or

near the summit and spicate or capitate; pappus-paleae commonly 10, some (commonly 5) subulate, others (commonly 5) shorter and blunt.—(*C. cephalotes* Greene.)

Dry hills and mountain slopes: Calistoga and Marin Co., southward to the Santa Cruz Mts. July-Sept.

4. *C. spicata* Greene. Slender, simple, rigidly erect, about 1 ft. high; floral leaves terete, truncate at apex and tipped with a stipitate gland, ciliate with white hairs; heads subsessile in the axils of all the leaves from below the middle and thus spicate; ray-flowers 1 or 2; achenes canescent with appressed hairs, those of the ray scarcely angled; pappus brownish, the paleae 10 or 11, subulate, $1\frac{1}{2}$ times as long as the achene; corolla-lobes of disk-flowers hispidulous.

Common on the plains of the San Joaquin Valley between Oakdale and La Grange. June.

5. *C. hispida* Greene. Erect, simple, 2 ft. high; leaves 2 to $2\frac{1}{2}$ in. long, or the fasciated ones much shorter, all hispid, at least towards the base; heads rather large ($\frac{1}{2}$ in. long) on short axillary branchlets; flowers yellow; rays about 4; corolla-lobes of disk-flowers densely covered on the outside with many short glandular processes or slender papillae; achenes hispid with short brownish appressed hairs; pappus of about 11 subequal paleae tapering to a point.

San Joaquin Valley: Lathrop; Atwater, Kern Co.; Tehachapi. June.

51. BLEPHARIZONIA Greene.

Stout somewhat coarse and hirsute annuals with glandular-viscid ill-scented herbage. Cauline leaves linear and entire, those of the branches oblong to oval. Flowers yellow, the heads arranged in panicles. Ray-flowers 7 to 10, with 3-lobed ligules; disk-flowers 10 to 25, the outer ones subtended by 1 or 2 series of linear bracts. Achenes silky-hirsute, 10-striate; those of the disk more or less fertile, crowned by a pappus of about 20 short and stout densely plumose awns; those of the ray fertile, elongated-turbinate, the pappus like that of the disk or dissimilar and minute. (Greek blepharis, an eyelash, and zonia, a girdle, in reference to the circle of pappus-awns.)

Pappus of disk and ray unlike.....1. *B. plumosa*.
Pappus of disk and ray similar.....2. *B. laxa*.

1. *B. plumosa* (Kell.) Greene. Two to 3 ft. high, copiously beset above with tack-shaped glands; leaves on the branchlets small and bract-like; heads 15 to 20-flowered, racemously disposed on the branches; bracts of the involucre short and very glandular; ray-achenes with a minute crown of short scales; disk-achenes with nearly erect plumose bristles as long as the achene.—(*Hemizonia plumosa* Gray.)

Antioch and Stockton.

2. *B. laxa* Greene. Three to 6 ft. high; heads larger, borne singly at the ends of the branches, 20 to 25-flowered; pappus of disk-achenes short and spreading, less plumose than in the preceding, only $\frac{1}{2}$ as long as the achene; ray-achenes similar.—(*Hemizonia plumosa* var. *subplumosa* Gray.)

Stockton to Stanislaus Co. Doubtless not specifically distinct from the preceding.

52. LAYIA H. & A.

Vernal annuals with alternate leaves (or the lowest opposite in one species) and usually showy heads of flowers terminating the branches. Disk-corollas yellow. Ray-flowers 8 to 20, yellow, white, or yellow tipped with white. Bracts

herbaceous, the thin margins at base enfolding the achene and usually deciduous with it. Receptacle broad and flat, with a row of thin bracts between ray- and disk-flowers, and sometimes with additional ones among the disk-flowers. Ray-achenes flattened, without pappus, almost always glabrous. Disk-achenes commonly pubescent, with a pappus of 5 to 20 paleae or bristles or rarely none. (G. Tradescent Lay, botanist to the Beechey Expedition which visited California in 1827.)

A. Pappus-bristles hairy or long-plumose below.

Bracts of the involucre hirsute or hispid (the basal margin where folded around the achene not denticulate-ciliate).

Inner hairs of pappus-bristles woolly and interlaced.

Rays white and

Inconspicuous; leaves all entire.....1. *L. hispida*.

Showy; lower leaves incised or toothed.....2. *L. glandulosa*.

Rays yellow (rarely white-edged).....3. *L. elegans*.

Hairs of pappus-bristles straight (no woolly inner ones).

Rays wholly white.

Rays conspicuous, much exceeding the disk; interior plains.....2. *L. glandulosa*.

Rays inconspicuous, scarcely exceeding the disk; seashore.....4. *L. carnosa*.

Rays yellow, or yellow and white (herbage hispid, the stems brown-spotted at the base of the bristles).

Rays short (1 to 2 or 3 lines long).....5. *L. hieracioides*.

Rays showy (5 lines long or more) and

Yellow; pappus-bristles twice as long as the soft basal hairs..6. *L. gaillardiioides*.

White, yellow below the middle; pappus-bristles scarcely exceeding the soft hairs.

7. *L. nemorosa*.

B. Pappus consisting of naked bristles.

Bracts of involucre denticulate-ciliate on the margin at base; rays yellow, white-tipped....

8. *L. platyglossus*.

C. Pappus, when present, consisting of flattened awns or paleae instead of bristles.

Bracts of the involucre denticulate or ciliate on the basal margins where folded around the achene.

Heads erect; rays yellow, white or glabrous at summit.

Achenes of both disk and ray glabrous; pappus none.....9. *L. chrysanthemoides*.

Achenes of disk pubescent or hairy; pappus present.

Leaves ciliate; pappus-paleae unequal.....10. *L. calliglossa*.

Leaves not ciliate; pappus-paleae about equal.....11. *L. fremontii*.

Heads nodding in bud and fruit; rays yellow.....12. *L. nutans*.

1. *L. hispida* Greene. Diffusely branched from the base, 1 ft. high or less; herbage densely hispidulous throughout; leaves narrow, all entire; heads small; rays white, inconspicuous; pappus-bristles 10, slender, bearing copious short interlaced hairs.—(*Blepharipappus hispidus* Greene.)

Mt. Diablo and Kern Co., acc. to Greene. Probably a variety of the next.

2. *L. glandulosa* (Hook.) H. & A. Commonly branching from the base, 8 to 12 or 14 in. high; leaves and stems (particularly near the heads) with scattered or abundant stipitate dark glands; leaves lanceolate or linear, the lower pinnatifid or toothed, the upper entire; involucre 4½ lines broad; rays 8 to 10, pure white, 6 or 7 lines long; pappus bright white, the bristles 10 to 12, with straight hairs towards the base outside and woolly tangled hairs inside; achenes 1½ to 2¼ lines long.—(*Blepharipappus glandulosus* Hook.)

Antioch, north to British Columbia and south to Southern California. Apr. Var. *HETEROTRICHA* Hall. Often rough-hispid; rays 10 to 18; inner woolly hairs of pappus wanting.—Sandy fields; Lake Co. (acc. to Greene); San Joaquin Valley. (*Blepharipappus glandulosus* var. *heterotrichus* Jepson.)

3. *L. elegans* (Nutt.) T. & G. Simple or diffuse, 8 to 11 in. high; herbage short-hispid; the stems often brown-dotted; stipitate glands small and scattered; leaves linear, the lower pinnately toothed or parted; rays yellow, 6 to 8 lines long, sometimes white-edged; pappus white, the villous hairs copious

but much shorter than the awn-like bristles.—(*Blepharipappus elegans* Greene.)
Montane: Ukiah; Calistoga; Southern California.

4. *L. carnosa* T. & G. BEACH LAYIA. Diffusely branched, 5 to 9 in. high, somewhat pubescent, scarcely at all glandular; leaves about $\frac{1}{2}$ in. long, succulent, spatulate to linear-oblong, toothed, the rameal rarely toothed; rays $\frac{1}{2}$ line long; pappus-bristles 23 to 28, sparsely plumose with straight soft hairs; bracts of the receptacle ciliate; disk-achenes thickly covered with short hairs.—(*Blepharipappus carnosus* Greene.)

Seabeach sands from Humboldt Co. to Monterey and southward. Ray-achenes pubescent, acc. to Gray; glabrous in Pt. Reyes specimens collected by Parry.

5. *L. hieracioides* (DC.) H. & A. Coarse erect plant, 2 to 3 ft. high; stem mostly simple below and branching above, hispid with hairs arising from dark spots; lower leaves oblong, 2 to 4 in. long, 3 to 9 lines wide, lacinate-dentate, usually somewhat narrowed at base; upper leaves broadest at the sessile base, the teeth fewer and mostly towards the apex; heads 5 to 6 lines broad; rays yellow, short, little exceeding the disk; pappus-bristles about 15.—(*Blepharipappus hieracioides* Greene.)

Oakland and Berkeley hills, on wooded slopes, north to Mendocino and south to Santa Barbara. May.

6. *L. gaillardoides* H. & A. Rather freely branching, 8 in. high or more, hispid, the stems dark-dotted; leaves more or less lacinate-pinnatifid, or the upper entire; heads larger than in *B. hieracioides*; rays orange-yellow, 5 to 9 lines long; pappus dull white or rusty, the bristles 15 to 20, twice as long as the soft basal hairs.—(*Blepharipappus gaillardoides* Greene.)

Mendocino Co. to the upper San Joaquin Valley.

7. *L. nemorosa* (Greene) Jepson, n. comb. Slender, usually sparingly branched above, 1 to 2 ft. high, hispidulous; leaves narrowly or broadly linear, entire or sparingly dentate; heads the size of the preceding; rays white, pale yellow below the middle; pappus-bristles short, little or not at all surpassing the abundant soft brown hairs.—(*Blepharipappus nemorosus* Greene.)

Mt. Tamalpais; Oakland Hills; Moraga Valley; Mt. Diablo. May-June. Perhaps too near the preceding.

8. *L. platyglossa* Gray. TIDY TIPS. Stem simple or more commonly branching below, erect or sometimes diffuse, 9 to 16 in. high; herbage short-hirsute and stipitate-glandular; leaves linear and entire or the lower commonly pinnatifid into short linear or oblong lobes; peduncles turbinate-thickened beneath the head; involueral bracts linear, denticulate-ciliate on the lower half; rays 13, 5 to 6 lines long, sulphur-yellow, the tips white; disk-achenes somewhat flattened, $1\frac{1}{4}$ lines long, densely clothed with upwardly pointing silky hairs; pappus-bristles 15 to 20, nearly as long as the corolla.—(*Blepharipappus platyglossus* Greene.)

Valleys and plains, common in the Coast Ranges and in the Sacramento and San Joaquin valleys, south to San Diego. Apr.-May.

L. PENTACHAETA Gray. The only other species with naked bristles; rays golden yellow; bristles 5, sometimes fewer.—Sierra Nevada foothills.

9. *L. chrysanthemoides* (DC.) Gray. Habit and aspect of *B. platyglossus* or of *B. douglasii*; flowers and heads the same; achenes entirely glabrous, broader, without a disk at summit, the corolla covering the top of the ovary; pappus none.—(*Blepharipappus chrysanthemoides* Greene.)

Common about San Francisco Bay: Millbrae, San Mateo Co.

10. *L. calliglossa* Gray. Comparatively glabrous, the stems for the most

part puberulent only above and the leaves merely finely ciliate; lower leaves pinnately parted or lobed, upper entire; achenes villous-pubescent or partly glabrate; chaffy bracts to most of the disk-flowers as also in the next; pappus of about 10 to 18 unequal and rigid subulate awns, which are somewhat scabrous or slightly hirsute near the dilated base, the marginal ones rather shorter than the corolla, the smaller hardly half as long.—(*Calliglossa douglasii* H. & A. *Blepharipappus douglasii* Greene.)

Common around San Francisco Bay. Var. *OLIGOCHAETA* Gray. Leaves less lobed; pappus of only 2 slender (and often short) marginal awns or with some intervening rudiments.—Conn Valley, Napa Co.; Santa Rosa. May. (*Blepharipappus douglasii* Greene var. *oligochaetus* Greene.)

11. *L. fremontii* (T. & G.) Gray. About 1 ft. high, minutely pubescent; leaves mostly pinnately parted, not ciliate; pappus-paleae ovate- to oblong-lanceolate, tapering into a subulate awn, nearly equalling the corolla, the margin entire, accompanied by some long-villous free hairs.—(*Blepharipappus fremontii* Greene.)

Upper Sacramento Valley southward to the San Joaquin.

12. *L. nutans* Jepson, n. comb. Low, 5 to 7 in. high, the branches slender and divergent; herbage hirsute, especially the leaves, the stems reddish brown; leaves linear, all entire, the lower pairs opposite; peduncles somewhat stipitate-glandular; heads erect in flower, nodding in bud and fruit; rays 5 to 7, yellow, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; achenes $1\frac{1}{2}$ lines long, hispidulous; pappus-bristles narrowly lanceolate, acuminate, 8 to 10, unequal, with barbellate margins.—(*Blepharipappus nutans* Greene.)

Mountain slopes: Napa Range; Mt. Hood Range. May. Excellent species.

53. LAGOPHYLLA Nutt.

Soft-villous or hirsute annuals with rigid and brittle stems, in ours usually becoming naked below by the early falling of the lower leaves. Leaves alternate or the lower opposite, mostly entire. Flowers pale yellow. Heads small, subtended by foliaceous bracts. Bracts of the involucre 5, thin-herbaceous, flat on the back, with margins at base infolded and completely enclosing an obcompressed achene, with which it is deciduous. Receptacle small and flat, bearing about 5 perfect disk-flowers, these surrounded by a single row of distinct chaffy bracts. Rays cuneate, palmately 3-cleft. Ray-achenes obcompressed, obovate-oblong, smooth, nearly straight, pointless; disk-achenes slender, sterile. Pappus none. Bracts and glabrous achenes all deciduous at maturity. (Greek lagos, a hare, and phyllon, leaf, the upper leaves sometimes copiously villous on the margin.)

1. *L. ramosissima* Nutt. Stem simple, at length paniculately very much branched; leaves (especially the upper) silky-hirsute with soft hairs, the short ones subtending the heads densely villous-ciliate; lower leaves oblanceolate or linear-lanceolate, often narrowed at base to a slender petiole, 1 to $2\frac{1}{2}$ in. long, often becoming concave or involute when dry; heads almost sessile, crowded on the leafy branchlets; rays barely exerted, pale yellow; fertile achenes carinately 1-nerved down the inner face.

Common on dry hills and plains in the Coast Ranges (Solano Co., Napa Valley, Healdsburg, Alameda Co.), Sierra Nevada foothills and Southern California. Var. *CONGESTA* Jepson. Robust, nearly simple, very short branches, 1 to $1\frac{1}{2}$ ft. high or much branched and nearly 3 ft. high; heads larger, in thick glomerules.—North Coast Ranges: Mt. Tamalpais; Pleasant Valley, Solano Co.; Lake Co.

54. HOLOZONIA Greene.

Perennial by creeping rootstocks. Stems slender and branches almost filiform. Leaves opposite or the upper alternate. Heads solitary, on slender or filiform peduncles, without leafy bracts. Flowers white or rose-tinged; rays 5. Bracts of the involucre 5, completely enclosing and deciduous with the obcompressed ray-achenes. Bracts of the receptacle 9 to 12, connate into a cup surrounding the few disk-flowers. Ray-achenes crowned with a small saucer-shaped pappus; disk-achenes with a pappus of 2 slender deciduous paleae. (Greek holos, whole, and zonia, zone, the bracts completely enclosing the ray-achenes.)

1. *H. filipes* (H. & A.) Greene. Stems often paniculately branching, $1\frac{1}{2}$ to $2\frac{3}{4}$ ft. high; leaves linear, canescent or villous, those of the filiform branchlets oblong with marginal short-stipitate glands; involucre loosely villous; bracts of receptacle chaffy.—(*Lagophylla filipes* Gray.)

North Coast Ranges: Mt. Tamalpais; Sonoma Co.; Napa Range; Sierra Nevada; Mariposa Co.; Calaveras Co.; El Dorado Co. July-Aug. Lowest leaves linear or somewhat lanceolate, commonly with 1 to 3 small teeth on each side, 1 to 4 in. long; upper entire, glabrate in age.

55. ACHYRACHAENA Schauer.

Soft-pubescent annual with narrow leaves, the lower opposite. Involucre oblong-campanulate, its bracts lanceolate, herbaceous, each enfolding a ray-achene. Bracts of the receptacle membranous, in a single outer series. Receptacle low-convex, naked. Flowers golden yellow, aging into reddish brown. Ray-flowers 5 to 8, little exceeding the disk, their ligules short and broad, palmately 3-cleft. Achenes linear-clavate, all the ribs or the alternate scabrous. Disk-achenes with a pappus of about 10 silvery scales, the outer as long as the achene, the inner nearly twice as long. (Greek achuron, chaff, and Latin achaenium, an achene, on account of the very chaffy pappus borne on the fruit.)

1. *A. mollis* Schauer. BLOW-WIVES. Erect, simple or branching, 9 to 18 in. high, pilose-pubescent; branches more or less peduncle-like, each 1-headed; leaves linear, entire or serrulate, 5 in. long or less; heads in flower $\frac{3}{4}$ in. high, in fruit expanding and forming a globose cluster $1\frac{1}{2}$ in. broad; paleae of the achenes also expanding or diverging rotately.

Abundant in adobe soil of the plains and valleys: Sierra Nevada foothills; San Joaquin Valley; Sacramento Valley; Coast Ranges; Southern California. Readily recognized in fruit by its expanded heads of black achenes with their silvery pappus. Ray-flowers sometimes absent. Apr.-May.

TRIBE 7. Heliantheae. SUNFLOWER TRIBE.

56. ECLIPTA L.

Low weak riparian herb with opposite leaves and white flowers. Heads solitary in the upper axils, the peduncles long or very short. Involucre broad, its bracts herbaceous and in about 2 series. Bracts of the receptacle awn-like. Rays short. Disk-flowers perfect and fertile, their corollas 4-toothed. Achenes thick, those of the ray 3-sided, those of the disk compressed. Pappus none or of a few short teeth. (Greek ekleipta, wanting, on account of the absence of the pappus.)

1. *E. alba* Hassk. Decumbent, 1 or 2 ft. high; leaves lanceolate or oblong-lanceolate, sparingly serrulate, sessile or the lower short-petioled with a strigose pubescence; disk-achenes at length corky-margined.

Shores of islands in the lower Sacramento River. Sept.

57. **BALSAMORRHIZA** Hook. BALSAM ROOT.

Low perennials with thick terebinthine-scented roots, crowned by a tuft of radical leaves and several naked or few-leaved stems, bearing solitary heads of yellow flowers. Outer bracts of the broad involucre foliaceous. Ligules with a distinct tube. Achenes destitute of pappus, those of the disk 4-sided. (Greek balsamon, balsam, and rhiza, root.)

1. **B. hookeri** Nutt. Herbage canescent with fine short hairs; leaves 7 to 10 in. long, pinnately divided, the divisions serrate or again pinnately divided; scapes equaling or exceeding the leaves, bearing solitary heads; bracts of the involucre oblong-lanceolate; bracts of the receptacle linear, acuminate, the outer with green tips; heads 2 to 2½ in. broad, including the ample rays.

Santa Barbara, San Martin (Santa Clara Co.) and the Oakland Hills through the Coast Ranges to Tehama Co., and north to Washington. Rare in our district. May.

58. **WYETHIA** Nutt.

Perennial herbs. Root very stout, crowned by a short caudex which bears a tuft of ample leaves and several simple 1-headed stems. Leaves mostly entire, the cauline mostly few and smaller. Heads large. Involucre hemispherical or campanulate, its bracts in 2 or 3 series, the outermost often foliaceous and much enlarged, the innermost small and bract-like. Receptacle flat or nearly so, its bracts rigid, linear or lanceolate, either flattish or partially folded around the achenes. Flowers yellow, both ray and disk fertile, the latter perfect; ligule of ray-corollas elongated and very conspicuous. Branches of the style in perfect flowers produced into subulate-filiform hispid appendages. Achene prismatic-quadrangular. Pappus firm and persistent, consisting of a crown of unequal scales, or with rigid awns at the angles. (Capt. Nath. J. Wyeth, with whom Nuttall crossed the continent in the early part of the 19th century.)

Leaves elongated-lanceolate, the cauline sessile; outer bracts of the involucre not foliaceous, little or not at all surpassing the disk.....1. *W. angustifolia*.

Leaves elongated-oblong or ovate, the cauline short-petioled; involucre foliaceous, the outer bracts spreading and commonly much surpassing the disk.

Herbage minutely or even floccose tomentose.....2. *W. helenioides*.

Herbage perfectly glabrous, glandular-pubescent and roughish.....3. *W. glabra*.

1. **W. angustifolia** Nutt. Stems 1 to 2 ft. high, hirsute; herbage green; leaves elongated-lanceolate, acuminate at both ends, occasionally serrulate, the radical and lower ones ½ to 1 ft. long, the upper sessile and smaller; heads naked, i. e., not leafy at the base, the bracts of the involucre numerous, broadly linear or lanceolate, loose, ciliate with villous or hirsute hairs; achenes minutely pubescent at summit, 3 lines long, bearing 1 or 2 (or those of the ray 3 or 4) stout minutely hirsute awns, with some very short intervening chaffy scales, all more or less united at base, rarely awnless.

Common on the plains and low hills: Monterey Co.; San Mateo Co.; San Francisco Co.; Oakland Hills; Mt. Diablo; Solano Co. and northward to Shasta Co. The green shoots are eaten raw by the Hupas.

2. **W. helenioides** Nutt. One to 2 ft. high, soft-tomentose, almost glabrous in age; radical leaves 1 to 2 ft. long, 4 to 6 in. wide, acute at base and apex, often undulate, long-petioled; cauline leaves much smaller, more commonly oblong-ovate; heads 3 in. broad, including rays, mostly leafy at base; outer scales of the involucre ovate-lanceolate or ovate, sometimes toothed; pappus and upper portion of achenes slightly pubescent, at least when young.

Common in the Coast Range hills: San Luis Obispo Co.; Oakland Hills; Antioch; Vaca Mts., etc. Apr.-May.

3. **W. glabra** Gray. MULE-EARS. Green and glabrous throughout, minutely resinous-glandular or viscid, and scabrous, at least when dry; leaves as in the preceding, or broader and obtuse, sometimes toothed, rarely undulate; achenes and pappus glabrous.

Marin Co.; San Mateo; Antioch; San Joaquin Valley. Less common than no. 2 and scarcely differing except in surface character of the leaves and stems.

59. **HELIANTHUS** L. SUNFLOWER.

Stout coarse herbs with petioled simple leaves, yellow mostly entire rays and brownish or purplish disk. Leaves (all but the lower or lowest) alternate. Heads large, solitary on the ends of the branches or in terminal corymbs. Bracts of the involucre imbricated. Receptacle flat or convex, its bracts persistent and embracing the 4-sided achenes. Pappus of pointed paleae borne at the angle of the achene, often with very small intervening scales, all deciduous. (Greek helios, sun, and anthos, flower, the heads turning toward the sun.)

Annuals; heads terminal on the branches.

Bracts of the involucre ovate.....1. *H. annuus*.

Bracts of the involucre lanceolate or oblong-lanceolate.

Stems scabrous; awn of the chaffy bract equaling the disk-flowers.....

2. *H. bolanderi*.

Stems often hirsute, particularly near the heads; awn of the chaffy bract surpassing the disk-flowers.....3. *H. exilis*.

Perennial; heads corymbose-paniculate at the summit of the simple stem; bracts with long spreading tail-like tips.....4. *H. californicus*.

1. **H. annuus** L. COMMON SUNFLOWER. Stems erect and simple or more or less branching, 2 to 5 ft. high; herbage rough-hispid; leaves deltoid-ovate, serrate, the uppermost narrow and often entire; bracts of the involucre ovate, slenderly acuminate; disk 1 in. in diameter, more or less; rays 1 to 1½ in. long.

Plains of the San Joaquin and Sacramento valleys, first appearing in low places along country roads. July-Sept.

2. **H. bolanderi** Gray. Stems erect or diffusely branching, 1 to 3 ft. high, scabrous-hispid; leaves ovate- to oblong-lanceolate, serrate or entire; rays 8 lines long, toothed at apex; disk purple, 9 or 10 lines broad; bracts of the involucre hirsute, oblong-lanceolate, attenuate or acuminate; bracts of receptacle chaffy, 3-toothed, the middle tooth much longer and awn-like.

Abundant in low grain fields of the Sacramento Valley, thence westward to the coast. Aug.-Sept.

3. **H. exilis** Gray. Slender, often unbranched, 1 to 2 ft. high; leaves ovate-lanceolate to linear-lanceolate; peduncles often hirsute-villous beneath the heads; bracts of the involucre lanceolate, hairy on the lower half; rays 6 or 7 lines long; awn-tip of the chaffy bract surpassing the disk-flowers.

Common in valleys about Clear Lake and on the Sacramento Valley plains. Aug.

4. **H. californicus** DC. Stems from somewhat tuber-like roots, 4 to 11 ft. high; leaves from oblong to narrowly lanceolate, some of the lower ovate, minutely hispidulous, 5 to 9 in. long including the petiole, the lower opposite, the upper alternate, the larger 3-ribbed; heads ¾ in. high, in a terminal corymbose panicle; chaffy bracts of the receptacle obtuse; bracts of the involucre lanceolate, tapering into long spreading tail-like tips; rays about 15 to 20, 1 in. long or more; achenes flattish, glabrous; pappus of 2 or 3 lanceolate chaffy paleae.

Stream beds and banks; Coast Ranges (Napa Range, Vaca Valley, Suisun Marshes, Alameda, San Jose); Sierra Nevada; Southern California. Sept.

60. *HELIANTHELLA* T. & G.

Low nearly acaulescent perennial herbs. Leaves entire, chiefly radical, the reduced cauline mostly opposite. Flowers yellow. Heads large, solitary, long-peduncled. Involucre hemispherical, its bracts linear-lanceolate and loosely imbricated, the outer mostly foliaceous and attenuate-acuminate, the innermost shorter and chaff-like. Receptacle flat or convex, its bracts embracing the achenes. Achenes commonly compressed, with thin or margined edges and emarginate summit. Pappus an awn or chaffy tooth from each margin, and usually with very small intermediate scales. (Diminutive of *Helianthus*.)

1. *H. californica* Gray. Stems slender, 1 to 2 ft. high, occasionally branched; herbage minutely scabrous; leaves ovate to oblong-lanceolate, tapering into petioles; rays $\frac{1}{2}$ to 1 in. long, usually little longer than the involucre; bracts of receptacle obtuse; achenes obovate, smooth, glabrous and narrowly margined, minutely ciliate when young only near the summit; pappus of two teeth and a crown of minute scales, the whole sometimes obsolete at maturity.

Higher mountain ridges: Coast Ranges (Contra Costa, Marin, Napa and Solano cos. and northward to Mt. Shasta); Sierra Nevada. May.

61. *BIDENS* L. BUR MARIGOLD.

Herbs (ours annual), with opposite leaves and yellow flowers. Heads many-flowered; rays 3 to 9, neutral. Involucre double, the outer bracts linear-oblong, foliaceous, the inner elliptic to ovate, membranous. Achenes somewhat flattened parallel with the scales of the involucre or slender and 4-sided, those of the disk crowned with 2, 3, or 4 rigid persistent retrorsely barbed awns. (Latin *bidens*, 2-toothed.)

Leaves simple; rays 3 to 9, conspicuous; achenes downwardly barbed on the margin; rays showy.

Outer involucre little or not at all surpassing the disk; rays very showy, golden yellow...

1. *B. chrysanthemoides*.

Outer involucre foliaceous and surpassing the disk; rays usually light yellow, smaller...

2. *B. cernua*.

Leaves pinnately 3 to 5-divided; rays 1 to 5, inconspicuous; achenes upwardly barbed...

3. *B. frondosa*.

1. *B. chrysanthemoides* Michx. BUR MARIGOLD. Often decumbent at base, 1 to 3 or even 4 ft. high, glabrous; leaves lanceolate, usually tapering at the base, evenly serrate, more or less connate at base, 7 in. long or less; outer involucre rather longer than the inner, much surpassed by the oval golden brown rays, these 1 in. long or more; disk brownish; heads in fruit erect, seldom slightly nodding; achenes flat or flattish, cuneate, distinctly carinate on the sides and retrorsely hispid on the marginal angles; awns 2 or 3, retrorsely barbed.

Low wet ground: Alvarado marshes; lower Sacramento River. Sept.-Oct. Var. *NASHII* Jepson. Leaves minutely serrate or almost entire, somewhat fleshy, some of the upper often very broad at base but rarely clasping; achenes slightly contracted at summit.—San Francisco, acc. to Wiegand.

2. *B. cernua* L. SMALLER BUR MARIGOLD. Stems 8 to 20 in. high, glabrous or setulose-hispid; leaves oblong-lanceolate, rather irregularly serrate, mostly not connate; outer involucre bracts exceeding the disk, spreading, foliaceous; rays 6 to 10, mostly light yellow, 3 to 6 lines long, sometimes none; heads strongly nodding in fruit; achenes 4-angled and usually 4-awned.

Less common than the last.

3. *B. frondosa* L. BEGGAR-TICKS. Erect, 3 or 4 ft. high, glabrous or slightly pubescent; leaves 3 to 5-divided, the divisions or leaflets petiolulate, lance-

olate, coarsely toothed; rays 1 to 5, inconspicuous, usually shorter than the greenish yellow disk; achenes very flat, cuneate-oblong, 4 to 5 lines long, dentate on the margin with barbs upwardly pointed (except at the summit), 2-awned; heads erect in fruit, surpassed by the outer foliaceous bracts.

Lower Sacramento River; very common. Sept.

62. LEPTOSYNE DC.

Perennials with thickened fleshy stems or ours annuals and almost acaulescent. Leaves dissected into narrowly linear or filiform lobes. Flowers yellow, in showy heads on long naked peduncles. Rays several or numerous, oblong or obovate, 3-toothed at apex. Involucre double; bracts of the inner series 8 to 12, erect, membranous; bracts of the outer series 5 to 8, narrow, loose and foliaceous. Receptacle nearly flat, its bracts thin, scarious, linear or lanceolate, falling with the fruit. Achenes flattened, more or less wing-margined. Pappus a minute ring or cup, or consisting of linear paleae. (Greek leptosune, slenderness.)

Achenes alike in ray and disk; pappus cup-shaped; corolla-tube without a hairy ring....

Achenes of 2 different shapes, those of the disk long-villous; pappus paleaceous; corolla-tube with a hairy ring towards the summit.....2. *L. calliopsidea*.

1. *L. stillmanii* Gray. Nine to 12 in. high, stoutish, leafy below and with manifest branches; leaf-divisions 1 line broad; involucre commonly somewhat hairy at base; disk-corollas beardless; achenes surrounded by a thick and corky rugose wing, smooth and glabrous on the back, the inner face sparsely papillose, or with a row of tubercles on the median ridge; pappus-cup either entire or 2-lobed.

Sacramento Valley.

2. *L. calliopsidea* Gray. Leafy, with less scape-like peduncles, 1 to 2 ft. high; bracts of the outer series of the involucre broadly ovate, a little shorter than the narrowly ovate inner ones, commonly 1 in. long, $\frac{3}{4}$ in. wide and 15 to 20-nerved; ring of the disk-corolla pubescent; achenes of the ray- and outer disk-flowers oval, flat and glabrous; disk-achenes cuneate-oblong, long-villous on the margins and inner face; pappus-paleae 2, linear.

Moist hillsides in the South Coast Ranges; Southern California.

TRIBE 8. Ambrosieae. RAGWEED TRIBE.

63. IVA L.

Ours coarse herbs with thickish alternate (or the lower opposite) leaves and small nodding heads of greenish white flowers. Involucre hemispherical, its bracts few and rounded. Receptacle with chaff-like linear or spatulate bracts. Marginal flowers of the head pistillate, 1 to 5 in number, their corollas tubular or none. Disk-flowers perfect, with 5-lobed funnelform corolla and undivided style. Anthers almost distinct. Achenes flattened, glabrous. Pappus none. (Said to be named after *Ajuga iva* of the Mint Family, on account of the similar odor.)

1. *I. axillaris* Pursh. POVERTY WEED. Stems many, erect from a decumbent or prostrate base, 6 to 10 in. high; leaves narrowly obovate, varying to lanceolate or linear, entire, sessile; heads solitary in the axils, short-peduncled, surpassed by the leaves; bracts of the involucre united into a lobed or merely toothed cup.

Alkaline plains and borders of salt marshes: Coast Ranges; Sacramento Valley; San Joaquin Valley; Southern California; British Columbia; Nebraska. Aug.-Sept.

64. **AMBROSIA** L. RAGWEED.

Ours a coarse homely but aromatic perennial herb with alternate pinnatifid leaves and inconspicuous greenish unisexual flowers. Heads of staminate flowers disposed in erect catkin-like racemes:—involucres broadly turbinate; receptacle of at least the outer flowers with slender bracts; corollas funnel-form, 5-lobed. Heads of pistillate flowers in the axils of the upper leaves at the base of the staminate racemes:—involucres oblong or turbinate, closed, containing but a single flower; corolla none; pappus none; fruit an achene-like bur which is beaked or pointed and is armed near the top with a single row of prickles. (Ancient Greek name.)

1. **A. psilostachya** DC. WESTERN RAGWEED. Stems simple, erect, 1, 2 or more ft. high, from slender running rootstocks; herbage pubescent and somewhat strigose; leaves once or the lower twice pinnatifid; fruit an obovoid turgid bur, mostly solitary in the axils, bearing 4 protuberances or sometimes unarmed.

Uncultivated lands in the Sacramento Valley, eastward and southward; common about San Francisco Bay. Sept.-Oct.

65. **FRANSERIA** Cav.

Branching herbs, ours perennial, sometimes woody at the base. Leaves chiefly alternate. Habit, flowers and inflorescence as in Ambrosia. Involucre of the pistillate heads closed, 1 to 4-celled, 1 to 4-beaked or pointed, armed with several rows of prickles and in fruit becoming a bur. (Ant. Franser, Spanish botanist.)

Leaves twice or thrice pinnatifid or pinnately parted.....1. *F. bipinnatifida*.
Leaves (at least the upper) undivided and merely serrate.....2. *F. chamissonis*.

1. **F. bipinnatifida** Nutt. Stems procumbent, herbaceous, 2 or 3 ft. long, somewhat hirsute; leaves twice or thrice pinnately parted into oblong lobes, canescent or almost silky; spikes dense; bur narrowly ovate, armed with thick somewhat flattened spines, some of which are curved at the tip.

Common on sandy seabeaches along the coast, and also at Alameda and West Berkeley. Aug.-Oct.

2. **F. chamissonis** Less. Habit of the preceding; leaves narrowly ovate or obovate, with cuneate base, serrate, or the lower laciniate or incised; bur thicker, sparsely hirsute, the spines broader and channeled.

Seabeaches along the coast; less common.

66. **XANTHIUM** L.

Coarse (by some called vile) annual weeds with widely branching and very stout stems. Leaves alternate, toothed or lobed, petioled. Heads unisexual, composed of greenish flowers. Staminate heads subglobose, in a terminal cluster:—involucre of several distinct narrow bracts in a single row; receptacle cylindrical; flowers many, separated by the bracts of the receptacle; corolla tubular. Pistillate heads axillary, below the staminate:—involucre closed, forming in fruit an ovoid or oblong indurated bur covered all over with hooked prickles, 1 or 2-beaked, 2-celled, each cell containing 1 flower; corolla none; pappus none; style 2-cleft, its branches exerted through the beaks. (Greek xanthion, yellow, from its yielding a hair-dye of that color.)

Leaves deltoid-ovate; stems not spiny.....1. *X. canadense*.
Leaves lanceolate; stems bearing spines by the sides of the leaves.....2. *X. spinosum*.

1. **X. canadense** Mill. COCKLE BUR. Stems about 2 ft. high, not prickly; leaves deltoid-ovate or somewhat cordate, irregularly serrate, or somewhat

incised, often distinctly 3-lobed, rough, hispidulous and green both sides, 3 to 4 in. long, on petioles nearly as long; bur $\frac{2}{3}$ to 1 in. long, thick, pubescent or glandular between and on the lower part of the crowded prickles and bearing at apex a pair of strong beaks hooked or incurved at tip.

Naturalized weed, native of the eastern United States, exceedingly abundant in low or marshy lands, often covering hundreds of thousands of acres. Flowering in summer and fruiting in autumn. V. K. Chesnut reports that the seedlings have been fatal to hogs.

2. *X. spinosum* L. SPINY CLOUTER. Stems puberulent, much branched; leaves lanceolate or ovate-lanceolate, acute or acuminate, 2 or 3-lobed or -cut, or the upper entire, narrowed at base into a short petiole, green above, white-pubescent beneath, 2 to 5 in. long; by the sides of the leaves are borne yellowish 3-pronged spines 1 in. long; corolla pubescent with short rusty hairs; bur narrowly oblong, $\frac{1}{2}$ in. long, sparsely prickly; beaks inconspicuous, only one spinose.

Naturalized European weed, everywhere a common summer tenant of barnyards and neglected fields. Suspected of being poisonous to cattle.

TRIBE 9. Inuleae. EVERLASTING TRIBE.

67. MICROPUS L.

Small floccose-woolly annuals with entire leaves and scattered several-flowered discoid heads. Bracts of the involucre open, scarious, surrounding the flower-bearing bracts of the receptacle. Bracts of the receptacle conduplicate, tipped with a scarious appendage and almost concealed by the clothing of long loose wool, each one enclosing a pistillate flower; sterile flowers in the center mostly naked. Achenes gibbous, the corolla and style borne laterally, without pappus, remaining enclosed in the cucullate bracts which finally fall away from the receptacle. (Greek micros, small, and pous, foot, in allusion to the soft-woolly heads.)

Beak-like tip to the fruiting bract largely scarious, erect, short.....1. *M. californicus*.
Beak of the fruiting bract wholly hyaline, in anthesis as long as the body.....2. *M. amphibolus*.

1. *M. californicus* F. & M. Slender, erect, 4 to 8 in. high, commonly branched only at the very summit; leaves linear-oblong, acuminate; receptacle low, with several scale-like processes; fruit-bearing bracts 4 to 6, at length indurated, the surrounding bracts of the involucre commonly 5; these orbicular or ovate, scarious, with a green spot in the center; staminate flowers about 3, the corolla filiform, but expanding somewhat toward the throat.

Very common on low hills or valley land through the Coast Ranges and Sacramento and San Joaquin valleys to Southern California. Apr.-May.

2. *M. amphibolus* Gray. Resembling the preceding but the fruiting bracts 9 or 10 and comparatively thin and soft; receptacle elevated or oblong; staminate flowers subtended by linear thin chaff-like bracts and with a pappus of few bristles.

Walnut Creek, Contra Costa Co., Brewer.

68. STYLOCLINE Nutt.

Low floccose-woolly annuals with entire leaves and terminal discoid heads in small clusters. Pistillate flowers with filiform corolla, their bracts ovate, boat-shaped, borne on a slender column-like receptacle, with erect hyaline tip and the conduplicate body loosely enclosing the achene; pappus none. Sterile flowers few in the center, their bracts plane or barely concave and their pappus caducous or none. (Greek stulos, a column, and kline, a bed, on account of the form of the receptacle.)

Bracts of the sterile flowers inconspicuous, oblanceolate, acute; pappus present.....

1. *S. gnaphalioides*.
Bracts about sterile flowers ovate-lanceolate, tapering into a conspicuous rigid hooked
cusp; pappus none.....2. *S. filaginea*.

1. *S. gnaphalioides* Nutt. Loosely white-woolly, diffusely branched, the stems 4 to 9 in. long; leaves broadly linear or the upper oblong, obtuse, barely 3 lines long; pistillate (or fertile) flowers numerous, their bracts ovate, nearly plane on the upper surface, a central portion at the base produced on the lower side into a sac enclosing the achene, this portion firm, the remainder hyaline; sterile flowers little shorter than their bracts, with rudimentary ovary and a pappus of few caducous bristles.

Stanislaus Co. to Monterey and Southern California. Sac woolly on lower side. Sterile flowers little shorter than their bracts.

2. *S. filaginea* Gray. Erect, branched from the base, 2 to 8 in. high, canescent with fine appressed wool which is later flocculent; cauline leaves narrowly linear ($\frac{1}{2}$ line wide), those involucre to the heads much broader; fertile flowers 5 to 9, their bracts boat-shaped, firm except at the hyaline tip, smaller than the 5 empty bracts which surround the sterile flowers in the center; empty bracts somewhat coriaceous, tapering into a rigid incurved hooked cusp, persistent, and at length stellately spreading.

Mendocino Co.; Tehama Co.; Mt. St. Helena; south to Southern California and north to Oregon. Aspect suggestive of *Filago californica*.

69. *PSILOCARPHUS* Nutt.

Depressed or prostrate white-woolly annuals. Leaves opposite, entire, the uppermost involucre around the small sessile globose heads, which are solitary in the forks or at the ends of the branches, or some clustered. Heads discoid. Bracts clothed with soft wool, crowded on the low receptacle and forming a globose head; each bract sac-like, half-obcordate or obovate in side view, hooded and rounded at the top with the apex introrse (turned downward and inward) and beaked by a hyaline appendage or scale. Flowers unisexual; pistillate flowers loosely enclosed in the sac-like bracts, with filiform corollas; staminate flowers few, occupying the center of the head and naked, *i. e.*, destitute of enclosing or other bracts. Achenes straight or slightly curved. Pappus none. (Greek *psilos*, bare, and *karpheos*, chaff.)

Involucre leaves obspatulate, 3 or 4 times longer than the head.....1. *P. tenellus*.
Involucre leaves oblong to lanceolate, 1 to 2 times as long as the head.....2. *P. oreganus*.

1. *P. tenellus* Nutt. Prostrate, the forking stems forming a dense mat 3 to 10 in. broad; leaves obspatulate, mucronate, 4 to 8 lines long; heads numerous, 2 lines wide; achene about $\frac{1}{2}$ line long, oblong or slightly broader toward the summit.

Valleys and low hills: Coast Ranges; Sacramento Valley; San Joaquin Valley; Southern California. Northward to Washington. June.

2. *P. oreganus* Nutt. var. *brevissimus* Jepson. Dwarfish, the stems prostrate, several to many from the base but mostly simple, 1 to 5 in. long; leaves oblong or some obspatulate, obtuse or merely acute, the involucre ones partly concealing the heads; heads comparatively few, 4 to 5 lines broad, more loosely woolly than in the preceding; staminate flowers about 7 or 8; achene cylindrical or slightly clavate, less than 1 line long.—(*P. brevissimus* Nutt.)

Dry beds of vernal pools: Solano Co. to Santa Clara Co. May-June.

70. *EVAX* Gaertn.

Dwarf rigid densely woolly annuals with entire leaves. Heads with disk-flowers only; pistillate flowers at base of slender columnar receptacle, the male

flowers above, all subtended but not enclosed by bracts. Bracts of the pistillate flowers and bracts of the involucre becoming hardened, persistent. (An Arabian chief who wrote to the Emperor Nero about simples.)

Heads mostly scattered.....1. *E. sparsiflora*.
Heads in terminal clusters.....2. *E. caulescens*.

1. *E. sparsiflora* (Greene) Jepson. Erect, 1 to 4 in. high, simple or commonly branching from the base, the heads in the axils, scattered along the branches or slightly glomerate at the ends of the branches; leaves spatulate, narrowed to a very slender petiole, 4 to 7 lines long; bracts of the receptacle woolly on back and rather densely long-hirsute at base, especially the upper; staminate flowers in center about 4.

Dry sterile soil: Healdsburg; Napa Valley; southward to Southern California.

2. *E. caulescens* Benth. Stem simple or with few long branches from the base, 2 to 8 in. high; heads all in a terminal hemispherical cluster, $\frac{3}{4}$ in. broad and surrounded by a whorl of many leaves; leaves spatulate-obovate, 1 to $1\frac{1}{2}$ in. long, the cauline similar but smaller.

Sacramento Valley. Var. *HUMILIS* Jepson. One or 2 in. high, the heads crowded on the short central stem or at the ends of the very short horizontal branches (none in the axils), the close clusters subtended by rosulately arranged leaves.—Antioch.

71. FILAGO L.

Low woolly annuals with entire leaves and small discoid heads in capitate clusters. Receptacle hemispherical or conical, its summit or center bearing a cluster of fertile and sterile flowers with rather copious capillary pappus and surrounded by a series of scarious or chaff-like bracts. Base of receptacle bearing several pistillate flowers with filiform tubular corollas, the achenes of each enfolded in a concave or boat-shaped bract, and destitute of pappus. (Latin filum, a thread, in allusion to the cottony pubescence.)

Leaves oblong, tapering toward the base, abruptly acute at apex, the uppermost subtending and often not surpassing the heads.....1. *F. californica*.
Leaves subulate with broadish base, the uppermost subtending and conspicuously surpassing the heads.....2. *F. gallica*.

1. *F. californica* Nutt. Erect, 4 to 9 (or sometimes 15) in. high, leafy throughout, the leaves 3 to 9 lines long; heads ovate, 2 lines long; receptacle convex, rough or somewhat bur-like; marginal bracts 8 to 10, very woolly, deeply boat-shaped and somewhat incurved at apex, spreading stellately at maturity; inner bracts oblong, plane or merely concave; marginal achenes smooth; central achenes dotted with shining papillae.

Dry hills throughout the State: St. Helena; Mt. Tamalpais, etc. May-June.

2. *F. gallica* L. Five or 6 in. high; leaves mostly exceeding $\frac{1}{2}$ in., those involucre to the heads soft but straight and, in appearance, rigid; receptacle nearly flat; heads conical and somewhat 5-angled; marginal achenes completely enclosed in the at length indurated base of the bract.

St. Helena, Jepson. Introduced from Europe.

72. GNAPHALIUM L. CUDWEED.

Woolly herbs with entire sessile or decurrent leaves. Heads discoid, white, yellowish, or rose-tinted, disposed in panicles, corymbs, or spikes. Receptacle flat or convex, not chaffy. Bracts of involucre scarious, imbricated. Pistillate flowers in several series with filiform corollas. Central flowers perfect, with tubular 5-lobed corollas. Pappus a single series of capillary bristles. (Greek gnaphalon, a lock of wool, these plants floccose-woolly.)

A. Pappus-bristles united at base, falling away in a ring.

Inflorescence spike-like; leaves white-woolly beneath, green above.....1. *G. purpureum*.

B. Pappus-bristles not united at base, falling separately.

Involucre imbedded in loose wool, its scarious-tipped bracts rather inconspicuous and dull colored; low branching annual.....2. *G. palustre*.

Involucre woolly only at base, its bracts mainly scarious or silvery.

Herbage in age becoming green (at least the upper surface of the leaves), more or less glandular.

Inflorescence corymbose; bracts pearly white; herbage balsamic-scented.....

3. *G. decurrens*.

Inflorescence paniculate; bracts white or rose-tinged; herbage sweet-scented.....

4. *G. ramosissimum*.

Herbage persistently woolly, not glandular or scarcely so.

Involucre bright white; inflorescence paniculate.....5. *G. microcephalum*.

Involucre greenish yellowish, becoming rusty; heads in capitate clusters or the clusters somewhat open-paniculate.....6. *G. chilense*.

1. *G. purpureum* L. PURPLE CUDWEED. Stems commonly simple and erect from a slightly decumbent base, 4 to 12 in. high; herbage canescent with a close dense coating of white wool, the upper surface of the leaves usually early glabrate; leaves broadly spatulate, obtuse, 1 to 2 in. long and 7 lines wide or less; heads crowded in a spike-like inflorescence which is dense and oblong, or more elongated and more or less interrupted; heads 2 lines long; involucre brownish or purplish; achenes sparsely scabrous.

Open ground, frequent: Napa City; Sausalito; Fish Ranch, Contra Costa Co.; Berkeley; San Francisco; Sierra Nevada. Annual or biennial.

2. *G. palustre* Nutt. LOWLAND CUDWEED. Annual, branching from the base, 3 to 8 in. high, erect or ascending; herbage loosely floccose with long wool, more or less deciduous from the leaves; leaves nearly all spatulate, or a few about the clusters of heads oblong or lanceolate, less than $\frac{1}{2}$ in. to 1 in. long; heads in small clusters at the ends of the branches, 1 to $1\frac{1}{2}$ lines high; bracts of the involucre linear, with white obtuse often denticulate tips.

Common in stream beds and low lands: Coast Ranges; Sacramento Valley; San Joaquin Valley; Sierra Nevada; Southern California. East to Wyoming and north to Washington. Var. NANUM Jepson. Dwarf, 1 to $2\frac{1}{2}$ in. high; bracts acute.—Dry wooded hills, in open places: St. Helena.

3. *G. decurrens* Ives var. *californicum* Gray. CALIFORNIA EVERLASTING. Biennial; stem stoutish, 2 or 3 ft. high, corymbosely branched at summit, the branches bearing glomerules of large heads and forming a broad and somewhat flat-topped inflorescence; herbage soon becoming green and more or less glabrate (except on the under surface of the leaves), at maturity glandular and balsamic-scented; lower leaves oblong ($\frac{1}{2}$ to 1 in. broad, and 2 to 5 in. long), diminishing in size upwards and becoming lanceolate, all obviously decurrent; heads roundish or broad, 3 lines high or slightly more, the involucre bracts white or in age rusty-tinged.

Dry wooded hills of the Coast Ranges: Lake Co.; Napa Range; Oakland Hills and southward to Southern California. May-July.

4. *G. ramosissimum* Nutt. PINK EVERLASTING. Biennial, 2 to 5 ft. high, the stems one to several from the base, ending above in a much branched panicle which is often narrow and sometimes virgate and frequently more than 1 ft. long; herbage glandular and very sweet-scented; leaves at length green on both faces, the stem more or less arachnoid; heads narrowly ovate or turbinate, 2 lines high, reddish or pinkish.

Wooded hills near the coast: Mt. Tamalpais; Oakland Hills and southward to Southern California; also in the Sierra Nevada. July-Sept.

5. *G. microcephalum* Nutt. WHITE EVERLASTING. Biennial; stems often

several from the base ($1\frac{1}{4}$ to $2\frac{1}{4}$ feet high), branching above into an elongated or sometimes broad panicle; herbage very bright white woolly, especially when young, the wool persistent; panicle often 1 ft. long; heads small, narrow, 2 lines long, disposed in rather small glomerules or clusters at the ends of the branches of the panicle; bracts of the involucre ovate or oblong and obtuse at apex, or the very innermost linear, bright white.

Wooded mountain slopes: Coast Ranges; Sierra Nevada; Southern California. Aug.-Sept.

6. *G. chilense* Spreng. COTTON-BATTING PLANT. Annual or biennial; stems several, erect from a decumbent base (or single and wholly erect), stout, $\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, often densely clothed with leaves; leaves narrowly spatulate (2 to 6 lines broad) or the uppermost linear or lanceolate, the short decurrent bases rather broad and somewhat auricle-like; heads 3 lines wide and high, numerous in a large close glomerule terminating the main stem, or in several glomerules at the ends of the branches of the more or less open panicle; involucres with a greenish yellowish tinge.—(*G. sprengelii* H. & A.)

Open ground in valleys or on low hills: San Francisco; Monterey and southward to Southern California.

73. ANAPHALIS DC. EVERLASTING.

Perennial herbs with simple erect equably leafy stems. Leaves green above, closely woolly beneath. Heads disposed in a compound corymb. Bracts of the involucre numerous, pearly white and scarious, imbricated in several series, radiating in age. Flowers yellow, dioecious:—staminate flowers with slender corolla and undivided style; pistillate flowers with a tubular 5-toothed corolla and 2-cleft style. Pappus as in *Gnaphalium*. (Ancient Greek name of some "Everlasting.")

1. *A. margaritacea* (L.) B. & H. PEARLY EVERLASTING. Stems several from the base, 1 to 2 ft. high; leaves broadly to narrowly lanceolate, sessile, with revolute margin, 3 to 5 in. long; corymb $1\frac{1}{2}$ to 6 in. broad.

Open woods: Coast Ranges (Monterey, Mt. Tamalpais and northward); Sierra Nevada. July-Sept. Var. *occidentalis* Greene. Leaves sessile by a broad auriculate-clasping base.—Oakland Hills; San Francisco, etc.

74. PLUCHEA Cass.

Leafy herbs with a strong odor of camphor. Heads numerous, clustered in corymb-like cymes, consisting of many purplish disk-flowers and no ray-flowers. Marginal flowers of the head pistillate and perfect, with tubular-filiform truncate corollas; central flowers few, perfect, but sterile, with tubular 5-cleft corollas. Involucre imbricated. Receptacle flat, naked. Achenes grooved. Pappus a single series of capillary bristles. (The Abbe N. A. Pluche, amateur naturalist, of Paris.)

1. *P. camphorata* (L.) DC. SALT-MARSH FLEABANE. Annual; stems stoutish, erect, branching above, $1\frac{1}{4}$ to $2\frac{1}{2}$ ft. high; herbage glandular-puberulent; leaves oblong-ovate or lanceolate, glandular-dentate, short-petioled or the upper sessile, the larger 3 to 5 in. long; heads $2\frac{1}{2}$ lines high, rarely leafy-bracted, in corymb-like cymes; bracts of the involucre ovate-lanceolate; achenes pubescent.

Common in the salt marshes about Suisun and San Francisco bays, southward to Kern Co. and Southern California.

75. ADENOCaulon Hook.

Perennial herbs. Stems slender, leafy only at the base, bearing above a

panicle of small and few heads of whitish flowers, the upper portion of the stem and the panicle beset with small glands. Leaves alternate, broad, petioled, green and early glabrate above, white-woolly beneath. Heads of few disk-flowers; ray-flowers none. Marginal flowers of the head pistillate and fertile, the central perfect, sterile and with undivided style; corollas of both sorts, tubular and alike. Bracts of the involucre 5, equal, in a single row, not scarious, reflexed in fruit, at length deciduous. Receptacle flat, naked. Mature achenes much elongated and clavate, covered above with stalked glands. Pappus none. (Greek adenos, a gland, and kaulon, a stem.)

1. *A. bicolor* Hook. Stems $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high, the lower portion floccose-woolly; leaves deltoid-ovate, cordate at the base, sinuate-dentate, $1\frac{1}{2}$ to mostly 3 or 4 in. long and as broad or broader; petioles margined; achenes 3 to $3\frac{1}{2}$ lines long, much longer than bracts of the involucre.

Woods: Coast Ranges; Sierra Nevada. Northward to Washington and far eastward. June.

TRIBE 10. *Astereae*. ASTER TRIBE.

76. *GUTIERREZIA* Lag.

Herbaceous or suffrutescent, the herbage resin-bearing, nearly glabrous. Leaves narrowly linear, entire, alternate. Heads very small, turbinate-oblong to campanulate, numerous and corymbosely arranged at the summit of the stems and branches. Bracts of the involucre coriaceous, the outer shorter. Receptacle in ours flat. Flowers yellow; rays short, in ours 8 to 10. Achenes angled or striate, mostly silky. Pappus paleaceous. (Name of a noble Spanish family.)

1. *G. californica* (DC.) T. & G. Plants 1 to $1\frac{1}{2}$ ft. high, the woody base much branched; leaves scabrous; heads fastigiately corymbose, 2 to 3 lines high; rays 8 to 10; disk-flowers 6 to 11; achenes densely silky; pappus of about 12 unequal paleae.

Dry hills of the South Coast Ranges towards the coast; Southern California; Arizona.

77. *GRINDELIA* Willd. GUM PLANT.

Coarse perennial herbs, sometimes suffrutescent at base. Leaves obovate or spatulate to oblong-lanceolate, commonly serrate. Heads gummy, medium-sized or large, solitary on the branches, ours with rays. Involucre campanulate or hemispherical, the bracts many-ranked, firm-herbaceous, often with attenuate squarrose points. Achenes short, truncate, compressed or turgid, glabrous. Pappus of 2 to 8 very readily deciduous awns or small scales. Involucral cups of the budding heads completely filled with the white or cream-like gummy exudation. (Hieronymus Grindel, Russian botanist, professor at Riga and Dorpat.)

Species of the Coast Range hills and valleys and interior plains; rays light orange or yellow.

Involucre mostly hemispherical, about $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter; bracts variable.....

Involucre urnshaped-campanulate, about $\frac{1}{2}$ in. in diameter; bracts linear-lanceolate or subulate, outer or all squarrose.....2. *G. robusta*.

Involucre small; bracts lanceolate, erect.....3. *G. camporum*.
Species of salt marshes; rays golden yellow.....4. *G. cuneifolia*.

1. *G. robusta* Nutt. var. *maritima* Jepson. Stems ascending or erect, 1 to $1\frac{1}{2}$ ft. high; herbage lightly pubescent; leaves narrowly or broadly oblong, in a few cases wider above, obtuse, or mostly acute, more or less serrulate; involucre $\frac{3}{4}$ in. broad or more; bracts linear-lanceolate, closely com-

packed, with erect or spreading tips; accessory foliaceous bracts, few or several unequal, ovate to lanceolate or linear, often deflexed.

Along the seaboard: Marin Co.; San Francisco; San Mateo Co. June-July. Foliaceous bracts very variable in shape and size, even on the same plant, always more numerous on the head terminating the main axis, few or sometimes none on the heads terminating branches. Var. *PATENS* Jepson. Stems 1 to 2 ft. high, mostly simple or with few strict 1-headed branches; herbage glabrous or finely puberulent; leaves oblong, the radical narrowed to a petiole, 3½ in. long or less, the cauline sessile, narrowed toward the base, serrate or often entire below the middle; involucre wholly or largely foliaceous, its bracts broad, erect, nearly equal, linear or lanceolate, 1 or 2 lines broad, not glutinous-compacted, sometimes with an inner involucre of subulate or filiform bracts which are glutinous-compacted.—Hill tops, not common: Berkeley Hills; Santa Cruz Mts. Var. *DAVYI* Jepson. Stems commonly clustered, erect, 2 ft. high, rarely simple, mostly with long 1-headed sparingly leafy peduncles; herbage glabrous, rarely puberulent, darker green than in the next species; radical leaves oblong or obovate, narrowed to a rather long, often winged petiole, serrate or coarsely and saliently toothed, 2 to 8 in. long, the cauline similar or sessile; heads naked; involucre ¾ to 1 in. broad, very gummy, its lanceolate bracts with subulate or filiform squarrose tips.—Valley lands about San Francisco Bay.

2. *G. camporum* Greene. WHITE-STEM *GRINDELIA*. Plants commonly 1½ or 2 ft. high, glabrous, the foliage light green; leaves mostly oblong, serrulate or denticulate, 1 to 2 in. long; heads paniculate-corymbose, never solitary; involucre urnshaped-campanulate, the short outer bracts linear-subulate, squarrose-deflexed, the inner lanceolate-subulate, with spreading tips or erect.

Abundant on the plains of the San Joaquin and Sacramento valleys and the dry inner Coast Ranges; Southern California. June-Aug. Stems usually white or whitish, in no. 1 darker or reddish. A preparation of the leaves is used externally as a remedy for Poison Oak poisoning.

3. *G. rubricaulis* DC. RED-STEM *GRINDELIA*. Stems commonly 2 ft. high, tufted, reddish or brownish, ending in a small corymb of about 3 or 4 heads or one-headed; herbage scantily soft-pubescent when young, in age mostly glabrous; leaves 2 to 5½ in. long, oblong, serrate and sessile especially toward the apex, or disposed to be entire, attenuate into a petiole as long as the blade, the cauline similar or sessile; heads small, ½ in. in diameter (not including the rays); involucre scales lanceolate, not squarrose, very slightly or not at all glutinous, sometimes tomentose.

Ridges and hillsides of the Coast Ranges, in openly wooded country: Mt. Tamalpais; Sonoma; Napa Range.

4. *G. cuneifolia* Nutt. MARSH *GRINDELIA*. Stems 2 to 3½ ft. high (commonly woody at base), ending in a corymbose panicle of several heads or the simple sterile shoots densely leafy at summit; leaves thick, oblong or cuneate-oblong, 2 to 5 in. long, with broadly sessile or clasping base, those of the flowering branches much reduced, oblong-ovate, entire or serrulate; involucre bracts lanceolate without spreading tips.

Salt marshes about San Francisco, San Pablo and Suisun bays. Aug.-Nov. Stems sometimes flexuous. Var. *PALUDOSA* Jepson. Five ft. high, with suffrutescent stems 1 to 2 ft. high lasting through the winter; cauline leaves sometimes triangular-oblong, with subauriculate clasping base.—Suisun Marshes.

78. *PENTACHAETA* Nutt.

Low and very slender annuals with narrowly linear and entire alternate

leaves. Heads small, solitary, or somewhat clustered at the ends of more or less naked branches, nodding in the bud. Receptacle convex. Involucre turbinate-campanulate, its bracts in 2 series, narrowly oblong, thin or membranous, scarious-margined, mucronulate, appressed. Disk-corollas yellow or rose-red, very slender; rays white, pink or yellow, or none. Achenes oblong, flattened, hirsute-pubescent. Pappus of 5 slender bristles, often with 2 reduced or wanting, or all obsolete. (Greek pente, five, and chaite, a bristle, in allusion to the pappus.)

Simple or with simple branches from the base, erect; peduncles white-villous beneath the head 1. *P. exilis*.
Dichotomous, and disposed to be diffuse; peduncles with scattered hairs..... 2. *P. alsinoides*.

1. *P. exilis* Gray. Simple or mostly branched from the base, erect, commonly 3 or 4 in. high; herbage purplish; branches or stems terminated by a single head ($1\frac{1}{2}$ to 2 lines high); involucre broadly campanulate; rays 8 to 14, 2 lines long; outer disk-corollas rose-red, widening upward, the throat abruptly contracted beneath the minute teeth; pappus oblong-turbinate, villous; pappus-bristles 3 or 5, sometimes abortive.

Coast Range hillsides: San Mateo Co.; Oakland Hills; Marin Co.; Napa Valley. Apr.-May.

2. *P. alsinoides* Greene. Dichotomously branching, 2 to 5 in. high; involucre narrowly or broadly turbinate, its bracts 5 to 7 or 9 and containing 3 to 7 flowers; disk-corollas filiform, with minute teeth; rays none; achenes obovate-clavate; pappus-bristles 3, very slender.

Coast Ranges: Berkeley Hills; Vallejo; Sonoma. Also in the Sierra Nevada. Apr.-May.

79. HETEROTHECA Cass.

Tall hairy herbs with alternate leaves and heads of yellow flowers in a terminal corymbose panicle. Involucre broadly oblong (or ovate in fruit), its narrow bracts closely imbricated in many series, without spreading tips. Both ray- and disk-flowers numerous and fertile. Ray-achenes triangular, with broad sides and narrow back; pappus none or caducous. Disk-achenes compressed, silky-hirsute; pappus double, the copious inner bristles long, capillary and scabrous, the outer of short and stout bristles or scales or inconspicuous. (Greek heteros, different, and theke, a case or ovary, the achenes of disk and ray dissimilar.)

1. *H. grandiflora* Nutt. Mostly simple below, 2 to 5 ft. high; peduncles with gland-tipped hairs; leaves ovate, varying to elliptic or oblong, serrate, the lower and radical long-petioled, the upper sessile by a rather broad base; heads rather large (4 or 5 lines high); rays about 30; pappus as long or longer than the achene, in age brick-red; outer pappus of disk-flowers inconspicuous.

Immigrant from Southern California: San Jose, etc. Aug.-Oct.

80. CHRYSOPSIS Ell.

Perennial herbs, sometimes suffrutescent, with entire leaves. Heads medium-sized, solitary or paniculate. Rays present or none. Involucre campanulate to hemispherical, its bracts narrow and regularly imbricated. Flowers yellow. Style-appendages linear-filiform to subulate. Achenes compressed or turgid. Pappus brownish or ferruginous, of numerous capillary bristles, with or without a short outer row of little scales. (Greek chrusos, golden, and ophis, aspect, from the color of the blossom.)

Heads with rays; corolla glabrous; outer pappus linear-squamellate: vars. of.....

Heads rayless; corolla sparingly hirsute; outer pappus none.....1. *C. villosa*.
.....2. *C. oregana*.

1. *C. villosa* Nutt. var. *bolanderi* Gray. Stems low, 3 to 12 in. high, rather stout, several from the woody base; herbage villous-pubescent and often scabrous, greenish or sometimes silky; leaves oblong-spatulate, mucronate, narrowed below to a distinct petiole or the upper sessile and less spatulate, or widest at the middle and tapering to both ends, mostly 1 in. long; heads 5 to 7 lines high, leafy-bracted, solitary or few in a corymbose cluster; involucre campanulate or cylindric-campanulate, its bracts lanceolate or subulate, villous-pubescent, in a few ranks; rays 4 to 6 lines long; pappus-bristles minutely scabrous, in a single row; outer pappus of little scales; achene silky, $\frac{3}{4}$ line long.

Dry hillsides or rocky hilltops near the coast: San Bruno Hills; San Francisco; Berkeley Hills and northward to the ocean bluffs of Mendocino Co., where it occurs in typical form. Sept. Var. *ECHIOIDES* Gray. Stems rigid, erect, 10 to 16 in. or even 2½ ft. high, usually suffrutescent at base; herbage dense, hirsute-canescens; leaves rigidulous, ½ in. long, the lowermost longer; involueral bracts hispid-pubescent, the foliose bracts often hispid-ciliolate; pappus-bristles in a single row; outer pappus consisting of very short little scales, not concealed by the pubescence of the achene.—Dry ground: Vaca Mts. and southward through the San Joaquin Valley and South Coast Ranges to San Diego Co. Var. *SESSILIFLORA* Gray. Stems few or several from a wooly root, 1½ to 2 ft. high, freely branching above, the heads 4 to 5 lines high and solitary, or 2 or 3 together at the ends of long branchlets; herbage hispid or villous-canescens or greenish, somewhat viscid; bracts sparsely hirsute, granulose-glandular; rays 3 or 4 lines long, corolla-tube 4-angled toward the base; slender little scales of the outer pappus often concealed by the densely villous hairs clothing the achene.—Santa Cruz Mts. and southward to Southern California.

2. *C. oregana* Gray. About 2 ft. high, of low bushy habit, branching freely but the branchlets often long; herbage hirsute with spreading white hairs but the aspect green; leaves oblong to lanceolate, ascending, 4 to 9 lines long, the netted veins purple under a lens; heads few or numerous, naked, the peduncles with 1 or 2 subulate bracts; bracts linear-lanceolate, in several series; corolla very slender, sparingly hirsute about the middle or on the lobes only; outer pappus none; achenes oblong.

Gravelly beds of streams in the Coast Ranges: Los Gatos to Lake Co. and northward to Oregon. Aug.-Sept. Var. *RUDIS* Jepson. Stems 8 to 12 in. high, arising from a stolon-like rootstock, simple below and bearing above a subcorymbose or paniculate cluster of heads; herbage hispid-pubescent or even canescens; leaves narrowly oblong, varying to lanceolate, acute or acuminate, cuspidate, the lower more often widest above the middle, $\frac{3}{4}$ in. long; involucre nearly or quite equaling the flowers, its bracts somewhat carinate or 1-nerved.—Sandstone stream beds: Napa Valley. Sept.-Oct.

81. *STENOTUS* Nutt.

Suffrutescent or shrubby plants with glabrous herbage and evergreen foliage. Leaves alternate, narrow and entire. Heads large and broad, on solitary peduncles. Involucre hemispherical, its bracts little imbricated (in 2 or 3 series), membranous with scarious margins, closely appressed. Flowers yellow; rays several to many. Achenes oblong, somewhat compressed, densely villous. Pappus of slender bristles, permanently white. (Greek stenotes, narrowness, in reference to the leaves.)

1. *S. linearifolius* (DC.) T. & G. Shrub 2 to 4 ft. high, with balsamic sticky herbage and stout woody branches; branchlets more or less fastigate, leafy below, nearly naked above and bearing solitary heads; heads hemispherical, $1\frac{1}{2}$ to 2 in. broad, including the rays; leaves much crowded or fascicled, linear, narrowed toward the base, $1\frac{1}{4}$ to 2 in. long, 1 to 2 lines wide; bracts of the involucre in 2 or 3 rows, all nearly equaling the disk, oblong, acute, greenish, the inner with broad scarious fimbriolate margins; rays 13 to 18, oblong-lanceolate; disk-flowers numerous; achenes white-silky; pappus white, soft and deciduous.—(*Aplopappus linearifolius* DC.)

Mountain peaks and slopes: Mt. Diablo southward to San Diego Co.; Sierra Nevada. Mar.-May.

82. ERICAMERIA Nutt.

Ours low evergreen shrubs or bush-like plants with narrowly linear or terete often heath-like leaves. Foliage punctuate, resin-bearing. Flowers yellow, the heads in terminal corymbose or cymose clusters. Rays present or none. Involucre turbinate, its bracts chartaceous or coriaceous, regularly imbricated. Achenes more or less prismatic. Pappus-bristles slender, scarious, dull white or yellowish, in age reddish. (Name from the resemblance of the minute evergreen leaves of the first species to *Erica*.)

Leaves terete, not viscid, imbricated on the short axillary branchlets; rays 5; coast plant..

1. *E. ericoides*.
Leaves narrowly linear, becoming filiform; rays none; montane plant..2. *E. arborescens*.

1. *E. ericoides* (Less.) Jepson. Low heather-like shrub (1 to 2 ft. high) with decumbent or ascending main stems and numerous erect branchlets; leaves linear-terete, 1 to 2 lines long, crowded or fascicled; heads 3 to 4 lines high, numerous, corymbose-paniculate; bracts of involucre tomentose-ciliolate, the inner narrowly oblong, acute, the outermost lanceolate, acuminate; corolla with dilated throat; rays about 5, 2 lines long; achenes cylindric, striate, glabrous; pappus dull white, aging slightly brownish.—(*Aplopappus ericoides* H. & A.)

Sand dunes along the coast: Bolinas Bay; San Francisco; Santa Cruz and southward to Los Angeles Co. Aug.-Sept.

2. *E. arborescens* (Gray) Greene. Erect, with fastigate branches, 3 to 5 ft. high; leaves numerous on the branches, narrowly linear, or closely revolute and becoming filiform, resinous-punctuate, $1\frac{1}{2}$ to 2 in. long; heads $2\frac{1}{2}$ to $3\frac{1}{2}$ lines high; bracts of the involucre lanceolate, acute, 2 lines long or less; rays none or rarely present; achenes canescent, somewhat quadrangular; pappus permanently dull white, its bristles unequal.—(*Bigelovia arborescens* Gray.)

Higher Coast Range hills, mostly from 1,000 to 2,000 ft. altitude, often occurring in chaparral or chamisal: Napa, Sonoma, Marin, and Contra Costa cos., southward to the Santa Cruz Mts. and Santa Barbara. Also in the Sierra Nevada. Sept.-Nov.

83. ISOCOMA Nutt.

Rigid plants, somewhat woody at base, with thickish leaves. Heads rayless, in a terminal corymbose cluster. Involucral bracts coriaceous, closely imbricated, the tips herbaceous, but appressed. Flowers yellow. Corolla-tube slender, the throat ventricose or obliquely dilated, its segments erect or more or less connivent about the style. Achenes longitudinally striate or ribbed, the intervals silky-pubescent or -hirsute. Pappus of numerous unequal bristles, the inner longest and often distinctly flattened. (Greek isos, equal, and koma, a tuft, the florets equal, not unequal as in *Lessingia*.)

1. *I. veneta* (H.B.K.) Greene var. *arguta* Jepson. Herbage with a rather

close and somewhat glandular indument, the stems villous-tomentose below, tufted, erect and suffrutescent, 7 to 15 in. high; leaves broadly oblong in outline, serrate at apex, more deeply toothed at base, sessile, 1 in. long or less; heads in a dense terminal corymb, 4 to 5 lines high; bracts of the involucre obtusely acute; achenes 3-angled or somewhat flattened, pointed at base, rather less than 2 lines long; pappus of rather rigid and unequal bristles.—(*Bigelovia veneta* Gray.)

Subsaline plains of the lower Sacramento Valley. Var. *VERNONIOIDES* Jepson. Leaves entire, or serrulate at apex, and commonly with fascicled ones in the axils: Southern California; upper San Joaquin Valley; introduced at San Francisco.

84. *SOLIDAGO* L. GOLDEN ROD.

Perennial herbs with alternate leaves. Heads small, the raceme-like clusters aggregated in a pyramidal or spike-like panicle or thyrus, or in one of our species the heads corymbose. Bracts of the involucre narrow, thin or chartaceous, imbricated in 2 or more series. Both ray- and disk-flowers yellow. Pappus a single series of scabrous and mostly equal capillary bristles, usually dull white. Achenes terete or angular, 5 to 10-nerved. (Latin *solidus* and *ago*, to unite firmly, certain species reputed to have wound-healing properties.)

Stems freely branching, the flower-clusters more or less distinctly corymbose; leaves linear, entire 1. *S. occidentalis*.
 Heads simple; the flowers disposed in a terminal panicle.

Heads small ($1\frac{1}{2}$ to 3 lines high).

Panicle mostly pyramidal; leaves serrate or entire.

Herbage grayish 2. *S. californica*.

Herbage nearly glabrous 3. *S. elongata*.

Panicle narrow and virgate; herbage glabrous; leaves entire 4. *S. sempervirens*.

Heads larger (4 lines high); heads in a spike-like thyrus; lower leaves spatulate, serrate towards the apex 5. *S. spathulata*.

1. *S. occidentalis* Nutt. WESTERN GOLDEN ROD. Stems 3 to 5 ft. high, very leafy, freely and paniculately branching, the branches terminated by more or less distinctly corymbose clusters of small heads; herbage glabrous; leaves linear or nearly so, entire, sprinkled with clear dots; heads 2 to $2\frac{1}{2}$ lines high; bracts of involucre chartaceous, linear-lanceolate; rays 16 to 20; disk-flowers 8 to 14; achenes turbinate.—(*Euthamia occidentalis* Nutt.)

Marshes, stream beds and river banks: Sierra Nevada; Sacramento and San Joaquin valleys; Coast Ranges; Southern California. Aug.-Oct.

2. *S. californica* Nutt. COMMON GOLDEN ROD. Stem simple below the terminal panicle, 2 to 4 ft. high; herbage grayish with a minute rough pubescence; leaves oblong, acute at apex and tapering below into a short petiole, the lower varying to oblong-obovate and serrate, the upper smaller, narrow and entire; panicle usually compact, dense, not leafy, 4 to 13 in. long, made up of raceme-like clusters (or when elongated, secund), seldom recurved at tip, sometimes spreading in age; heads $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; bracts of the involucre oblong-linear or lanceolate, somewhat pubescent; rays 7 to 12, pale yellow, about as many as the disk-flowers; achenes pubescent.

Common on dry plains and hillsides or in the mountains throughout California. Sept.-Nov. "Orojo de Leabre" of the Spanish-Californians.

3. *S. elongata* Nutt. Stem about 3 ft. high; very leafy; leaves almost or quite glabrous, often bright green, oblanceolate, narrowed to a distinct petiole, broadly oblanceolate, sharply serrate, except at base, or entire; panicle dense, thyrsoid-like, the heads little if at all secund in the raceme-like clusters; heads small, 2 lines high or less; bracts of the involucre thin, linear; rays 10 to 16, narrow, usually more numerous than the disk-flowers.

San Francisco, Monterey, and doubtless elsewhere near the coast; Sierra Nevada. July-Aug.

4. *S. sempervirens* L. One to 3 ft. high or more, leafy to the top; herbage bright green, completely glabrous; leaves lanceolate or linear, somewhat firm and fleshy, the lowest varying to oblong-spatulate, all entire; heads 2 to 3 lines high, the raceme-like clusters collected in a dense narrow virgate panicle; bracts of involucre lanceolate or linear-lanceolate, acute or obtuse, scabrous-ciliate; rays 7 to 10, large; achenes minutely pubescent.

Salt marshes, San Francisco Bay, *Bolander*. Rarely collected.

5. *S. spatulata* DC. COAST GOLDEN ROD. Stems 15 to 18 in. high, one or several from the decumbent base which is thickly clothed with broad leaf bases; herbage glabrous, slightly glutinous; leaves mostly basal, spatulate, rounded at apex, narrowed to a long margined petiole, more or less serrate above the middle; heads 4 lines high, in clusters of 4 to 12, the clusters borne in a single spike-like thyrsus terminating the simple stem; bracts of the involucre linear-oblong to oblong; rays about 7 or 8, inconspicuous, commonly shorter than the disk; disk-flowers about 14 to 16.

Sandy hills near the coast: Pt. Reyes; San Francisco; Pajaro Hills and southward to Monterey.

85. LESSINGIA Cham.

Annuals with alternate leaves, branching stems and commonly paniced heads of yellow, purplish, lilac or white flowers. Heads rather small, campanulate to turbinate, usually narrow, 5 to 25-flowered. Bracts of the involucre imbricated in several appressed ranks. Receptacle flat. Flowers perfect. Corollas with linear lobes, or those of the marginal rows enlarged, more deeply cleft on the inside, and simulating a palmately lobed ligule. Achenes all fertile, turbinate or cuneate, more or less flattened, silky-villous. Pappus commonly of numerous unequal scabrous bristles, usually turning reddish brown. (Named for the Lessings, German family of scientists and authors.)

A. Flowers yellow; marginal corollas conspicuously larger; achenes flattened, 2 or 3-nerved.

Leaves of the branchlets scattered, not gland-bearing; seaboard species. 1. *L. germanorum*. Leaves of the branchlets small and crowded, the margin gland-bearing; mainly interior species, as all the following.....2. *L. glandulifera*.

B. Flowers purplish, lilac or white; corollas all alike or nearly so; achenes less flattened, 4 or 5-nerved.

Erect slender freely branching plants.

Pappus of slender bristles.

Wool deciduous in age.

Corollas short.

Heads terminating slender branchlets.....3. *L. ramulosa*.

Heads more or less spicately sessile.....4. *L. virgata*.

Corollas conspicuously exserted.....5. *L. leptoclada*.

Wool more persistent in age.....6. *L. hololeuca*.

Pappus of paleaceous bristles, some commonly more or less united; upper leaves ciliate-glandular.....7. *L. adenophora*.

Depressed dwarfish plants; inner bracts of involucre pearly white and conspicuously awn-pointed.....8. *L. nana*.

1. *L. germanorum* Cham. Diffusely branched or erect, 4 to 8 in. high, or more; herbage with appressed white tomentum, wholly glabrate in age, at least on the branches; lowest leaves pinnatifid, those of the branchlets scattered, oblanceolate or linear and mostly entire; heads 21 to 25-flowered; involucre hemispherical, its bracts not glandular, with greenish tips or the outer wholly greenish; pappus-bristles about 35, 1 to 1½ times as long as the achene.

Sandy hills along the coast: San Francisco to San Luis Obispo Co. Sept.-Oct.

2. *L. glandulifera* Gray. Stem erect, stoutish, paniculately very much branched, $1\frac{1}{2}$ to 3 ft. high; leaves ovate or oblanceolate, toothed or cleft, persistently woolly, those of the branchlets numerous and even crowded, green; minute, with the margin bearing yellowish glands; involucre campanulate, its bracts more or less gland-bearing; heads 18 to 38-flowered; pappus-bristles of disk-flowers as long as corolla, about 35; pappus-bristles of ray shorter than corolla.

Plains of the lower San Joaquin Valley to Southern California. Aug.-Sept.

3. *L. ramulosa* Gray. Stems slender, 1 to $1\frac{1}{2}$ ft. high, loosely branching, granulose-glandular above or with minute tack-shaped glands; lowest leaves spatulate or oblong, denticulate or entire; upper lanceolate, mostly entire, those of the branchlets with partly clasping base; heads 10 to 25-flowered, 3 or 4 lines long, terminating diffuse slender branchlets; involucre turbinate or campanulate; corollas short, purple; pappus-bristles longer than the achene, 20 or more, sometimes more or less coalescent at base into sets.

Dry hills of the North Coast Ranges: Mt. Tamalpais; Cordelia; Napa Range and northward. Sept.

4. *L. virgata* Gray. Stem and virgate branches rigid; herbage more densely woolly; upper leaves appressed, concave, carinately nerved; heads solitary and sessile in the axil of a leaf of nearly the same length, thus forming a somewhat spicate inflorescence; involucre cylindrical, woolly, 5 to 7-flowered.

Plains of the Sacramento Valley.

5. *L. leptoclada* Gray. Simple below, branching above, 2 ft. high; lower leaves denticulate, those of the branchlets ovate or lanceolate with somewhat sagittately adnate base; branchlets virgate and almost filiform, bearing few or solitary heads; involucre turbinate; bracts in many ranks, greenish at tip and cuspidate; corollas conspicuously exserted.

San Mateo Co. and northward.

6. *L. hololeuca* Greene. Stem erect, with rigidly ascending branches, nearly 2 ft. high, the whole plant even to the involucre white-tomentose; leaves all entire, the basal ones spatulate and narrowed to a long petiole; cauline leaves oblong or ovate, sessile and almost cordately clasping; rameal ones small; all the leaves and the bracts of the involucre ending in a short spinescent tip; heads turbinate; corollas red-purple; pappus-bristles rufous.

Low hills of Sonoma Co., *Greene*. Perhaps too near *L. virgata*.

7. *L. adenophora* Greene. Repeatedly branched from the base, forming a densely bushy plant 1 ft. high or a little more; lower leaves round-ovate to oblong, somewhat cordately sessile, densely woolly above, glabrate beneath; margins of the leaves (particularly of the upper) densely beset with small stipitate glands; heads numerous, 7 to 10-flowered, on filiform branchlets; bracts of the narrowly campanulate or almost cylindrical involucre very acute, suberect, more or less glandular like the leaves, the inner chartaceous, purplish, bristle-pointed; corollas red-purple; pappus-bristles united into 4 to 7 paleaceous sets, each set composed of a single stout bristle or of 2 or 3 bristles, united for nearly their whole length, or only at base.

Mountains of the North Coast Ranges: northern Napa Co.; Lake Co.; Colusa Co. July-Aug.

8. *L. nana* Gray. Depressed, dwarfish, the whole plant densely tomentose with thick wool; stems 2 to 4 in. long, flowering from near the ground; heads 10 to 12-flowered and nearly $\frac{1}{2}$ in. long, subtended by oblong or lanceolate

leaves; outer bracts or involucre linear-lanceolate, somewhat herbaceous; inner bracts pearly white, tapering into a long awn which conspicuously equals or exceeds the flowers and the dark red pappus; achenes very short and turgid.

Sandy plains and foothills on the eastern side of the Sacramento and San Joaquin valleys. Aug.

86. *BELLIS* L. DAISY.

Low herbs with (in ours) radical leaves and solitary heads on scape-like peduncles. Disk yellow. Rays white, or tinged with pink. Involucre hemispherical, its bracts wholly herbaceous and green, equal, in 2 rows. Receptacle conical, destitute of bracts. Achenes flattened, without pappus. (Latin *bellus*, pretty.)

1. *B. perennis* L. Tufted perennial; leaves obovate, sparingly toothed, narrowed at base to a margined petiole, 1 to $1\frac{3}{4}$ in. long; peduncle about 4 in. high; rays about 50.

An occasional escape from gardens: Berkeley; Mill Valley. Established about Humboldt Bay.

87. *CORETHROGYNE* DC.

Perennial herbs, some resembling *Lessingia*, others *Aster*, but flowering in late spring or summer. Herbage whitened when young with a cotton-like tomentum, which is often deciduous in age. Heads solitary or corymbose or paniculate. Involucre hemispherical to turbinate, imbricated. Receptacle pitted. Ray-corollas ligulate, neutral. Style-appendages comose or with a bearded tuft. Achenes silky or pubescent. Pappus reddish brown, of rigid capillary bristles, present in the disk, reduced or none in the ray. (Greek *korethron*, besom, and *gune*, style, on account of the brush-like tuft of hairs on the style tips.)

Stem erect or ascending.

Heads in a panicle.....1. *C. filaginifolia*.
Heads on long corymbosely disposed peduncles.....2. *C. viscidula*.
Stems decumbent or prostrate; heads mostly solitary.....3. *C. californica*.

1. *C. filaginifolia* (H. & A.) Nutt. Two ft. high or more; tomentum floccose-deciduous; lower leaves $2\frac{1}{2}$ in. long, oblong-spatulate, narrowed to a slender petiole, passing into the upper small bract-like sessile ones, sparingly serrate towards the apex; heads turbinate-campanulate, 4 lines high, solitary and terminal on the branches or more numerous and loosely paniculate; rays violet.

Common at Monterey and south to Santa Barbara.

C. LEUCOPHYLLA Menzies. Small depressed persistently white-woolly plant; leaves numerous on the stems, $\frac{1}{2}$ in. long or less.—Sand dunes at Monterey.

2. *C. viscidula* Greene. Slender, loosely corymbose-panicled, 13 to 17 in. high; herbage hoary when young, becoming green and more or less glabrate; stems and both surfaces of the leaves glandular-seabrous; leaves oblanceolate, acute, serrulate, reticulate-venulose; heads 5 or 6 lines high, on rather long corymbosely disposed peduncles; peduncles with short-stipitate glands; involucre hemispherical, its bracts rather strongly imbricated and also viscid-glandular; pappus light brown.

Monterey, Parry, 1888; Santa Cruz Co., Jepson, 1896. Var. *GREENEI* Jepson. Lanate or floccose-tomentose, in age more or less glabrate, the peduncles and involucre glandular, the former with some stipitate glands as in the type; stems tufted, erect or ascending, 1 ft. high; leaves spatulate-oblong or above linear, entire or serrate towards the apex, 1 to $1\frac{1}{2}$ in. long; rays violet-purple; pappus rusty brown.—Dry cañons of Contra Costa and Alameda cos.: Niles,

etc. June-Aug. The species is greener and more obviously "glandular-scabrous."

3. *C. californica* DC. Plant white-woolly, with solitary heads on scape-like peduncles from prostrate or decumbent almost matted stems; involucre and summit of peduncle viscidulous-glandular; leaves spatulate or obovate, narrowed to a distinct petiole, entire or serrate towards the apex, 2 in. long or less; heads 4 or 5 lines high, 6 or 7 lines broad; rays deep purple; involucre and rays similar to the last.

Crystal Springs, San Mateo Co. Apr.-June. Var. *OBVATA* Jepson. Stems decumbent, 1 to 2 ft. long; herbage tomentose; leaves obovate-spatulate, toothed near the apex; heads 6 to 7 lines high, sometimes nearly 1 in. broad, inclined to be solitary; involucre glandular; rays purple; pappus of ray of 1 or 2 to 6 bristles; pappus of disk-flowers about 35 bristles, the longest $3\frac{1}{2}$ lines long.—Near the sea from Pt. Reyes and Bodega to Mendocino. July-Aug.

88. ASTER L. ASTER.

Late-aestival or autumnal herbs, with paniculate, corymbose, or racemose heads. Heads usually numerous. Involucre turbinate or campanulate to hemispherical, the bracts imbricated in several ranks, with green tips. Disk-flowers yellow, changing to purple or brown. Receptacle flat, pitted. Pappus copious, of simple capillary bristles. (Greek *astere*, a star, from the star-like heads of flowers.)

Perennial; rays conspicuous.

Inflorescence corymbose; leaves (at least some) elliptic-obovate.....1. *A. radulinus*.

Inflorescence paniculate or racemose; leaves linear to lanceolate.

Inflorescence mostly condensed, the heads on very short branchlets; herbage cinerous (and the pubescence harsher than in the next) or almost glabrous; leaves purple-veined beneath2. *A. menziesii*.

Inflorescence mostly loose, the heads or clusters of heads on long branchlets; herbage hirsute or villous-pubescent, or glabrous.....3. *A. chilensis*.

Annual or biennial; inflorescence paniculate; rays inconspicuous.....4. *A. exilis*.

1. *A. radulinus* Gray. BROAD-LEAF ASTER. One-half to $1\frac{1}{2}$, seldom 2 ft. high, scabrous-pubescent; leaves oval-obovate to oblong, 4 in. long or less, sharply serrate above the entire (often attenuate) base; heads mostly numerous (sometimes very few), corymbose, 5 to 6 lines high; involucre turbinate; bracts imbricated, the outer shorter, villous-puberulent; rays whitish, 3 to 5 lines long.

Dry hills, rather common: Monterey; Santa Cruz Mts.; Oakland Hills; Sonoma Co.; Vaca Mts.; Lake Co.; Sierra Nevada. July-Sept.

2. *A. menziesii* Lindl. PURPLE ASTER. Stems simple, commonly several from the woody root, $1\frac{1}{2}$ to 2 ft. high; herbage cinerous or almost glabrous, the foliage rough-pubescent; leaves linear to lanceolate, 1 to $2\frac{1}{2}$ in. long, purple-veined beneath, remotely serrate or entire, sessile, subcordate at base, those of the raceme or thyrsoid panicle much reduced, so that the inflorescence seems almost naked; heads 3 to 5 lines high on rigid erect branchlets; involucre hemispherical or broadly turbinate, the bracts linear-spatulate in several closely imbricated ranks, the green tips obtuse; rays violet or purple.

Low dry ground: Solano Co. and southward to Southern California. Sept.-Nov. Rare in our district.

3. *A. chilensis* Nees. COMMON ASTER. Two to $3\frac{1}{2}$ ft. high, villous-pubescent or more or less glabrous; leaves lanceolate, sessile, 5 in. long or less, entire, above passing gradually into the bract-like ones of the inflorescence, the radical oblong-spatulate, remotely serrate and attenuate into a petiole, all commonly with scabrous-ciliate margins; panicle of loose leafy racemes

6 in. long or more; heads 4 to 5 lines high; involueral bracts in several series, somewhat carinate, with green tips; rays white, lavender, or bluish, 4 to 6 lines long.

Wooded hillsides, dry banks of gulches or streams, or in moist situations in fields; the most common species of the Bay region. Sept.-Nov. Var. *LENTUS* Jepson. Slender, 4 to 6 ft. high, slightly succulent, mostly glabrous; heads few and large; rays 7 to 9 lines long.—Very common and conspicuous in the Suisun Marshes. Var. *MEDIA* Jepson. Branchlets of the inflorescence rather divaricate, with many spatulate-oblong or oblong-lanceolate spreading leaves 2 to 3 lines long; heads few, those on the same branchlets maturing at very unequal periods.—Lower Sacramento River; Saratoga. Var. *INVENUSTUS* Jepson. Herbage cinereous-pubescent; upper leaves and those of the inflorescence small; involueral bracts spatulate-linear, thickish, obtuse, in rather few ranks, almost wholly herbaceous; rays dull purplish.—Local form at Calistoga. Var. *SONOMENSIS* Jepson. Scarcely distinct from the preceding variety; slender, 1 ft. high, more glabrous; leaves mainly radical, oblong-spatulate, attenuate into a petiole $\frac{1}{2}$ to as long as the blade, remotely serrate; cauline much reduced, sometimes petioled, linear to lanceolate, those of the cymose panicle subulate-lanceolate and closely ascending; heads solitary or few at the ends of the strict branchlets; rays light pink to bright purple.—Subsaline lands: Petaluma; Napa.

4. *A. exilis* Ell. SLENDER ASTER. Erect, slender, glabrous, mostly with a rather narrow panicle; leaves linear, 2 to 4 in. long and 1 to 2 lines wide, or rarely some of the lower oblanceolate or oblong and 2 to 4 lines wide, entire, rarely serrate, those of the inflorescence lanceolate-subulate; heads 2 to 3 lines high; bracts linear, acute, herbaceous, scarious-margined; rays light pinkish purple, 2 lines long; pappus fine and soft.

Saline soil, not common: lower Sacramento River; Stockton; Alvarado. Sept.-Oct.

89. ERIGERON L. FLEABANE.

Perennial or biennial herbs with entire or toothed generally sessile leaves, and solitary or corymbose heads. Disk-flowers yellow; ray-flowers exceedingly numerous, pistillate, white or purple, the ligules almost filiform, or in some species wholly destitute of rays. Involueral bracts narrow, equal, little imbricated, seldom coriaceous or green-tipped. Receptacle flat or convex, naked. Achenes flattened, usually pubescent and nerved. Pappus more scanty and fragile than in *Aster*, often with a distinct short outer series. (Greek *eri*, early, and *geron*, an old man, "old man in spring.")

A. Rays present.

Annual; heads with inconspicuous rays not surpassing the disk.....1. *E. canadensis*.

Perennials.

Rays numerous, often 100 or more.

Leaves mostly entire; stem very leafy at base, the cauline leaves much reduced; maritime2. *E. glaucus*.

Leaves serrate, the cauline less reduced.....3. *E. philadelphicus*.

Rays conspicuous, about 30 to 40; stems very leafy; leaves linear or narrowly oblanceolate4. *E. foliosus*.

Rays filiform, comparatively few and inconspicuous; sparsely leafy; leaves filiform.....5. *E. setchellii*.

B. Rays none.

Perennials; leaves narrow and less than 1 (or 2) in. long.

Stems decumbent; heads large, 6 to 8 lines broad.....6. *E. supplex*.

Stems erect; heads smaller, 4 to 6 lines broad.

Herbage glabrous; leaves filiform or narrowly linear.....7. *E. angustatus*.

Herbage yellowish green; leaves linear.....8. *E. inornatus*.

Herbage canescent or rough-pubescent; leaves linear to oblong, often narrowed at base. 9. *E. miser*.

1. *E. canadensis* L. HORSEWEED. Stems erect, paniculately branching above the simple base, 2 to 5 ft. high; herbage hispid with scattered hairs or nearly glabrous, especially above; leaves linear to lanceolate, the lowest spatulate or narrowed to a petiole, 2 to 3 in. long; heads small ($1\frac{1}{2}$ to 2 lines high), very numerous in a dense panicle; rays very short and inconspicuous, white, 2-toothed.

A widely distributed naturalized weed very common in waste or half-cultivated lands, in late summer or autumn.

2. *E. glaucus* Ker. SEASIDE DAISY. Flowering stems erect, 4 to 8 (or 10) in. high, commonly one-headed, arising from a radical tuft of leaves crowning the fleshy caudex and often, also, from rosulate offsets terminating prostrate woody branches; stems pilose-pubescent, leaves finely puberulent, heads somewhat tomentose; leaves spatulate, obovate, entire, rarely with a small tooth on either side below the apex, 1 to 4 in. long; upper cauline small and sessile; heads large, $1\frac{1}{2}$ in. in diameter including the numerous rather broad lilae and violet rays.

Common on cliffs or sandy shores, near the sea only: San Francisco south to Santa Barbara and north to Oregon. July-Aug.

3. *E. philadelphicus* L. SKEVISH. Stems simple, 2 to 3 ft. high, branched only at or near the summit; herbage hispidly pubescent; leaves spatulate or obovate, serrate or coarsely few-toothed, the radical (including the long margined petioles) 5 to 11 in. long, the cauline with auriculate clasping base, 3 in. long, more or less; heads corymbose, commonly on rather long peduncles, $\frac{1}{2}$ to 1 in. in diameter; rays white or pink, numerous, narrow.

Along streamlets and by springy places in the hills and valleys: Coast Ranges and Sierra Nevada. Apr-May.

4. *E. foliosus* Nutt. Stems many from the base, erect, simple, corymbosely branching above, 1 to $1\frac{3}{4}$ ft. high; leaves crowded on the stems, conspicuously reduced only on the branches of the inflorescence, scabrous-hispidulous, linear or lanceolate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, 1 to 2 lines wide; heads rather few in an open terminal corymb, hemispherical, 10 to 11 lines broad, including the violet rays; rays about 30 to 40, 1 line wide; pappus coarse and rather short.

Common in the hill country: Marin Co. to the San Francisco Peninsula, Mt. Diablo and southward to Southern California. June-Aug.

5. *E. setchellii* Jepson. Stems smooth, $1\frac{1}{4}$ to 2 ft. high; herbage bright green, very brittle; leaves filiform, less than 1 in. long, muriculate-scabrous; heads hemispherical, 4 lines high, disposed in a rather broad proliferous corymb with a few subulate bracts at base; involucre inconspicuous, the subulate or lanceolate bracts unequal, the outer rough-hispid; rays light blue, about 25, filiform, 2 lines long; achenes glabrous.

Arid plains of the lower San Joaquin.

6. *E. supplex* Gray. Stems decumbent or ascending 4 to 8 in. high, terminated by a single broad short-peduncled head 4 to 6 lines high; herbage sparingly hirsute-pubescent or almost glabrous, the involucre canescently hirsute; leaves oblong-spatulate to linear-lanceolate, 1 to 2 in. long; bracts of involucre equal, linear-lanceolate.

North coast, rarely collected and apparently maritime: Gualala, Sonoma Co.; Mendocino City.

7. *E. angustatus* Greene. Stems several or many from a woody crown, 13 to 18 in. high; herbage glabrous throughout; leaves narrowly linear or filiform; heads solitary or in a corymbose panicle, subtended by a few subulate

bracts; involucre turbinate, slightly glandular; achenes somewhat pubescent, much compressed and with a reddish thickened callous-margin.—(*E. inornatus* Gray var. *angustatus* Gray.)

Dry hills of the Coast Ranges: Mt. St. Helena; Lake Co.; Calaveras Valley, Alameda Co.; depauperate forms 4 to 6 in. high with one-headed stems occur in Marin Co.

8. *E. inornatus* Gray. PINE ERIGERON. Stems simple, more or less clustered, 2 ft. high; herbage yellowish green, hispidly pubescent or glabrous; leaves linear, 1 to 2¼ in. long; heads 3 to 4 lines high, 10 to 20 in a depressed corymb; involucre campanulate; bracts unequal and somewhat imbricated.

Mountain ridges, common under Yellow Pine: Cobb Mt. and northward; Sierra Nevada. July-Aug. Var. *BIOLETTII* Jepson. Two ft. high, scabrous-puberulent; leaves oblanceolate, the margins obscurely hispid-ciliate.—Napa and Mt. Hood ranges.

9. *E. miser* Gray. Stems in a rather close tuft on a short woody caudex, very leafy; herbage canescently hirsute; leaves linear-oblong, or cuneately narrowed towards the base, less than 1 in. long; heads 4 lines high, few in a rather close corymb; involucre campanulate, the bracts imbricated.

Rocky summits of the Coast Ranges from Mt. Hamilton and Wild Cat Creek to Mt. Tamalpais and Mt. St. Helena. July-Aug.

90. BACCHARIS L.

Perennials, ours shrubs excepting one, commonly resinous or glutinous. Heads many-flowered. Involucre imbricated. Flowers whitish or yellowish, dioecious. Staminate flowers with tubular corolla slightly dilated at the throat, the limb cleft into 5 linear lobes; ovary abortive; style present. Corolla of the pistillate flowers very slender and thread-like, obscurely toothed at apex, the teeth erect, not spreading. Pappus of capillary bristles in the sterile plant scanty and tortuous; in the fertile very long and copious. (The god Bacchus.)

Evergreen shrubs.

Leaves obovate or cuneiform.....1. *B. pilularis*.
Leaves lanceolate, willow-like.....2. *B. viminea*.
Herbaceous perennial; herbage very glutinous.....3. *B. douglasii*.

1. *B. pilularis* DC. CHAPPARAL BROOM. Shrub, 2 to 5 ft. high; branchlets angular; leaves sessile, obovate or cuneiform, ½ to 1 in. long, coarsely or sinuately few-toothed, or occasionally entire; heads 2 or 3 in the axils or several in a terminal cluster, short-cylindrical or ovoid, 2 or 3 lines long, the outer bracts broadly, the inner narrowly oblong, sometimes denticulate at apex; pappus of the pistillate flowers becoming 4 or 5 lines long, that of the staminate flowers dilated at apex into a lanceolate appendage.

Common on low hills, high mountain slopes, or on the coast sand dunes (especially in a prostrate form), frequently gregarious: Coast Ranges south to Southern California and north to Oregon. Also in the Sierra Nevada.

2. *B. viminea* DC. MULE FAT. Distinctly shrubby, the stems loosely branching, very leafy, 5 to 7 ft. high; branches striate-angled; herbage scarcely glutinous; leaves lanceolate, acute at both ends, entire or sparingly denticulate, 1 to 3 in. long, very willow-like; heads 2 to 3 lines high, rather numerous in terminal corymbs or the clusters on short lateral branches and somewhat racemose; bracts of the involucre very thin, chartaceous, broadly lanceolate or the outer ones ovate, with scarious margins, erose and mostly villous-ciliate; receptacle flat; pappus of the fertile flowers of smooth bristles.

Stream-beds, Sacramento and Napa valleys southward to Southern California. July-Aug.

3. *B. douglasii* DC. Stems suffrutescent at base, 4 to 5 ft. high, simple up to the terminal corymb; herbage very glutinous; leaves lanceolate and very acute, or the lower ovate-lanceolate, 3 to 4 in. long, serrulate, almost entire; heads numerous in a terminal compound almost naked corymb; bracts of the involucre linear or lanceolate-linear with greenish center, the scarious margins crose-ciliate; receptacle broadly conical; pappus of pistillate flower short and soft, of the staminate clavellate at summit.

Moist lowlands: abundant in the salt marshes about San Francisco Bay, thence southward to Southern California.

TRIBE 11. Eupatorieae. EUPATORY TRIBE.

91. TRICHOCORONIS Gray.

Slender herb, the stems branching, weak or at base creeping. Leaves opposite, sessile. Flowers flesh-color, in slender peduncled heads terminating the branches. Receptacle convex, naked. Bracts of the involucre herbaceous or somewhat membranous, equal and nerveless, 12 to 18. Corolla abruptly much dilated above the narrow tube. Pappus of many small or minute paleae and awns, forming a sort of crown. (Greek trichos, hair, and koronis, top.)

1. *T. wrightii* Gray. Annual; stems assurgent, 6 to 9 in. high; leaves oblong or linear-lanceolate, remotely serrate or entire, auricled at base, $\frac{3}{4}$ in. long or less; heads 2 to $2\frac{1}{2}$ lines broad; achenes 4-angled, the angles hispidulous toward the summit; pappus of 4 barbellate bristles with an equal number of intervening but very small fimbriate paleae.—(*T. riparia* Greene.)

Lower San Joaquin River. Sept.

92. BRICKELLIA Ell.

Perennial herbs or suffrutescent plants with alternate petioled leaves and white or whitish flowers in terminal or subterminal clusters of narrow heads. Involucre imbricated, its bracts striately nerved. Receptacle naked. Corolla slender, 5-toothed. Achenes with 10 nerves or ribs. Pappus of numerous scabrous or barbellate capillary bristles mostly in a single series. (Greek koleos, sheath, and anthos, flower.)

1. *B. californica* T. & G. Stems many from the shrubby base, virgate or paniculately branching, 2 to 3 ft. high; leaves roundish or triangular-ovate, 3-ribbed and roughish, somewhat irregularly serrate, $2\frac{1}{4}$ in. long or less; heads spicate or racemose along the leafy branches, 5 or 6 lines long, 10 to 15-flowered, often more or less nodding; bracts of the involucre, especially the inner, with thin obtuse straight tips.—(*Coleosanthus californicus* Ktze.)

Gravelly stream beds of the Coast Ranges, especially toward the interior: Mendocino Co.; Calistoga; Vaca Mts. and southward to Southern California.

POISONOUS SPECIES

List of poisonous species, chiefly plants reported by cattlemen as poisonous to animals or as justly under suspicion. The list includes indifferently plants in which the whole plant is poisonous or only some one part, as the root, leaf, or seed. Only plants are listed which are described in the text. See General Index.

ACTAEA SPICATA Ait. (Willd.) var.	HYPERICUM CONCINNUM Benth.
ARGUTA Torr.	KALMIA POLIFOLIA Wang.
AESCULUS CALIFORNICA Nutt.	LEDUM GLANDULOSUM Nutt.
AGROSTEMMA GITHAGO L.	LOLIUM TEMULENTUM L.
ANEMONE QUINQUEFOLIA L.	MELILOTUS ALBA Desr.
APOCYNUM CANNABINUM L.	NICOTIANA GLAUCA Graham.
ASCLEPIAS ERIOCARPA Benth.	PHYTOLACCA DECANDRA L.
ASCLEPIAS MEXICANA Cav.	PRUNUS DEMISSA Walp.
ASCLEPIAS SPECIOSA Torr.	RHODODENDRON CALIFORNICUM Hook.
CALYCANTHUS OCCIDENTALIS H. & A.	RHODENDRON OCCIDENTALE Gray.
CAMASSIA ESCULENTA Lindl.	RHUS DIVERSILOBA T. & G.
CYNOGLOSSUM GRANDE Dougl.	RUMEX ACETOSELLA L.
DATURA METELOIDES DC.	SANICULA BIPINNATA H. & A.
DATURA STRAMONIUM L.	SENECIO VULGARIS L.
DATURA TATULA L.	SOLANUM NIGRUM L.
DELPHINIUM MENZIESII DC.	SYMPHORICARPOS RACEMOSUS Michx.
DELPHINIUM RECURVATUM Greene.	TYPHA LATIFOLIA L.
DIGITALIS PURPUREA L.	VERATRUM CALIFORNICUM Dur.
ESCHSCHOLTZIA CALIFORNICA Cham.	XANTHIUM CANADENSE Nutt.
EUPHORBIA LATHYRIS L.	XANTHIUM SPINOSUM L.
HERACLEUM LANATUM Michx.	ZYGADENUS FREMONTII Torr.
	ZYGADENUS VENENOSUS Wats.

GEOGRAPHICAL INDEX ¹

Bay region, the valleys bordering or opening to San Francisco and San Pablo bays with the adjacent mountain slopes.

Coast Ranges, the complex of ranges west of the Great Valley. See North Coast Ranges, etc.

Gabilan Range, range east of the Salinas Valley from the Pajaro River south to San Lorenzo Creek.

Great Valley, the great central valley of California, lying between the Sierra Nevada and Coast Ranges.

Howell Mountain, plateau mountain in Napa Range east of St. Helena town. Most excellent botanizing ground.

Inner Coast Range, the range next to the Great Valley; it is composed of a number of distinct ranges with specific geographical names.

Inner North Coast Range, the range bounding the Sacramento Valley on the west (including the Vaca Mountains north to the Trinity Mountains).

1. This list includes only the important mountains, ranges and valleys in the Bay region and adjacent territory.

Inner South Coast Range, the range bounding the San Joaquin Valley on the west (from Mt. Diablo south to Mt. San Emigdio).

Mayacamas Range, east of Ukiah Valley from Cobb Mt. and Geyser Peak northward to Cow Mt.

Mt. Diablo, prominent landmark in eastern Contra Costa Co.

Mt. Hamilton Range, the range east of Santa Clara Valley from Livermore Valley south to Pacheco Pass.

Mt. Hood Range, the range west of Napa Valley.

Mt. St. Helena, culminating point at south end of Mayacamas Range.

Mt. Tamalpais, southern Marin County, overlooking the Golden Gate.

Napa Range, or Napa Mountains, the range west of Napa Valley.

Napa Valley, lying between the Mt. Hood Range and the Napa Range.

North Coast Ranges, the ranges north of San Francisco Bay as far as the Siskiyou.

Point Reyes, peninsula on the Marin coast, formed by Tomales and Drake's bays.

Sacramento Valley, north arm of the Great Valley.

San Carlos Range, the inner South Coast Range from Panoche Pass south to Warthan Creek.

San Joaquin Valley, south arm of the Great Valley.

Santa Cruz Mountains, the range from Pajaro River north through San Mateo County to the San Bruno Hills.

Seaward or Outer Coast Range, the range next the ocean; applied more especially to the seaward North Coast Range.

Sierra Nevada, the main mountain axis on the eastern side of the Great Valley, south to Tehachapi Pass and north to Pitt River.

South Coast Ranges, the ranges south of San Francisco Bay as far as Santa Barbara County (Santa Maria River).

Southern California, a definitely defined portion of California, including the eight counties south of Tehachapi, namely, Santa Barbara, Ventura, San Bernardino, Los Angeles, Orange, Riverside, San Diego and Imperial. The phrases "northern California" and "central California" are, however, not geographically definite terms.

Vaca Mountains, range on west side of the lower Sacramento Valley from Putah Pass south to near Suisun.

Yollo Bolly Range, the inner North Coast Range from Snow Mountain north to the Bully Choop Mountains.

GLOSSARY

Acaulescent, apparently stemless, the leaves all borne at the surface of the ground and the flowers sessile or borne on a scape. (See *Cauliscent*.)

Accessory, something additional.

Accrescent, increasing in size or length with age, as the calyx or pedicel after flowering.

Accumbent, said of cotyledons with edges lying against the caulicle.

Acrose, with a sharp slender point like a needle.

Achene, a dry indehiscent 1-seeded fruit.

Acorn, fruit of the Oak.

Acuminate, tapering gradually to the apex.

Acute, with a sharp point.

Adherent, growing fast to or united with another body or organ of a different kind.

Adnate, growing fast to; literally, born united to another body.

Alternate leaves or branches, only one from each node.

- Amplexicaul*, said of a leaf with the base clasping the stem.
- Ancipital*, two-edged.
- Androgynous*, having both staminate and pistillate flowers in the same cluster.
- Annual*, a plant flowering and fruiting in the first year or season and then dying.
- Annular*, having the form of a ring, ring-like.
- Anterior*, the side in front; in an axillary flower, the side away from the axis; lower, inferior.
- Anther*, the sac or sacs containing the pollen, the essential part of the stamen.
- Anthesis*, the period during which a flower is expanded, the stigma receptive and the anthers shedding pollen.
- Antrorsely*, directed forward.
- Apetalous*, without petals.
- Apiculate*, ending in a short-pointed tip.
- Appendage*, any supplementary or superadded part.
- Appressed*, flattened or pressed against another body but not united with it; hairs lying flat on leaves are appressed.
- Approximate*, standing or borne close or near together.
- Aquatic*, living or growing in water; an "aquatic plant" may be wholly submersed or with only the base in water.
- Arcuate*, moderately curved.
- Areola*, an area with a distinct or raised boundary; the spaces between the reticulations or veins: in Compositae the disk or circle at the summit of the achene where sat the corolla.
- Aril*, an appendage of a seed growing at or about the hilum or summit of the funiculus; *arillate*, furnished with an aril.
- Aristate*, furnished with an arista or awn, like the beard or bristle of Barley.
- Articulation*, a joint; *articulated*, jointed or furnished with joints; where the stem or organ separates or is inclined to do so.
- Ascending*, rising gradually upwards.
- Assurgent*, rising or curving upwards.
- Attenuate*, gradually narrowed or prolonged.
- Auricled*, with ear-like lobes at base; auriculate.
- Awn*, a bristle, like the beard of Barley.
- Awned*, provided with a bristle.
- Axil*, the angle between a leaf and stem.
- Axile*, referring to or borne on the axis.
- Axillary*, borne or occurring in an axil.
- Axis*, the stem or longitudinal or central support on which parts or organs are arranged; a central line.
- Baccate*, of the nature of a berry, berry-like or pulpy.
- Banner*, the upper petal in a papilionaceous, or pea, flower.
- Barbed*, furnished with sharp rigid reflexed points, like the barbs of a fish-hook.
- Barbellate*, beset with short stiff hairs; *barbellulate*, the diminutive.
- Berry*, a fleshy indehiscent fruit, formed from a single superior or inferior ovary.
- Bi-*, a prefix to Latin words, two or twice.
- Bifid*, 2-cleft to the middle or thereabouts.
- Bilabiate*, a synsepalous calyx or sympetalous corolla cleft into two divisions, with an upper (superior or posterior) lip and a lower (inferior or anterior) lip; 2-lipped as the corolla of Sage or of Mimulus.
- Bilamellate*, of two plates or lamellae.
- Bipinnate*, twice pinnate.
- Blade*, the flat expanded portion of a leaf; said also of the broad portion of a petal, especially when it possesses a petiole-like base or claw.
- Bloom*, said when leaves and fruit are

- whitened with a fine powder or dust.
(See Glaucons.)
- Bract*, the modified or much reduced leaf of a flower-cluster; in Gramineae, the modified leaf subtending a spikelet; leafy-bracted, in Compositae, with accessory or foliose bracts to the head outside the involucre.
- Bracteate*, possessing or bearing bracts.
- Bractlet*, the small modified leaf subtending a flower or inserted on the pedicel, in Gramineae the lower of the two modified leaves subtending an individual flower.
- Bud*, the youngest or formative portion at the end of a stem.
- Bulb*, cluster of storage leaves set closely on a short stem axis and forming an underground organ.
- Bur*, a fruit covered with prominent spines.
- Caducous*, dropping off very early as compared with other parts; the calyx in the California Poppy falls when the flower opens.
- Caespitose*, said of stems when borne on the same stock in a close tuft.
- Callous*, with hardened and often smooth tissue or protuberances.
- Callus*, the tough often hairy swelling at base of the bractlet and palet in grasses.
- Calyculate*, said of the short bracts which occur at the base of the involucre proper in some Compositae and so imitate an exterior involucre.
- Calyx*, the outer, usually green, whorl of the flower.
- Campanulate*, bell-shaped.
- Canescent*, grayish white or hoary, the surface covered with fine white hairs.
- Capillary*, like a hair.
- Capitate*, gathered or collected into a head, or head-like.
- Capsule*, a dry dehiscent seed-vessel composed of more than one carpel.
- Carinate*, having a keel, sharp ridge, or carina.
- Carpel*, a simple pistil (which is typically 1-celled, with one placenta, one style, and one stigma), or one of the elements of a compound pistil; also applied to a simple pistil when mature or to one of the parts of a compound pistil which splits up when it is ripe. The number of carpels composing a compound pistil may be determined from the number of styles or stigmas, or, if these are blended, by the number of cells in the ovary, or, if but one cell, by the number of placentae.
- Cartilaginous*, firm and tough like cartilage.
- Caruncle*, an excrescence or process at the hilum in certain seeds.
- Catkin*, a scaly spike or ament, as in the Willow or Oak; in the Conifers applied to the staminate and ovulate clusters.
- Caudate*, bearing a slender tail-like body or appendage.
- Cauliscent*, having a distinct leafy stem above ground; plants with radical leaves and flowers on a scape are called acaulescent.
- Caulicle*, the stem in an embryo.
- Cauline*, pertaining to or borne on a stem, as cauline leaves.
- Chamise*, an individual but more particularly a colony of *Adenostoma fasciculatum*. (See General Index.) Also spelled Chamisal and Chamiso.
- Chaparral*, collective term referring to the colonies of thorny or rigid shrubs growing on mountain slopes. (See General Index.)
- Chartaceous*, having the thickness or texture of writing paper; most leaves are chartaceous.
- Choripetalous*, petals distinct and free from each other; not united even at base.
- Chorisepalous*, sepals distinct and free from each other.
- Ciliate*, having the margin bordered with a row or rows of hairs; *ciliate*, the diminutive.
- Cinereous*, of ashy hue.
- Circinate*, rolled into a coil from the tip.

- Circumscissile*, splitting at the middle with the upper part falling away like a lid.
- Clavate*, narrow but tapering gradually and regularly upward like a club; *clavellate*, the diminutive.
- Claw*, the narrow or petiole-like base of a petal.
- Cleft*, with sharp lobes, usually about to the middle.
- Coma*, a tuft of hairs; *comose*, furnished with a coma.
- Commissure*, the plane by which the flattened faces of the two carpels in Umbelliferae cohere.
- Complete*, said of a flower which has all the four circles, sepals, petals, stamens, and pistils.
- Complicate*, folded upon itself.
- Compressed*, flattened on the sides or laterally: compressed pod in Cruciferae, flattened parallel to the partition; compressed achenes in Compositae, flattened contrary to the plane of the bract; compressed fruit in Umbelliferae, flattened parallel to the plane of the commissure. (See Obcompressed.)
- Concolorous*, of one color.
- Conduplicate*, folded flat so that the folds or sides lie face to face.
- Connate*, united from the beginning (born united).
- Connective*, the portion of a stamen connecting the two cells of an anther.
- Connivent*, lightly joined or sticking.
- Contorted*, bent or twisted on itself or out of the usual position.
- Convolute*, rolled inwards from one side to the other.
- Cordate*, heart-shaped with the notch at the base.
- Coriaceous*, leathery in texture and stiffness.
- Corm*, a thickened or globose fleshy stem base, underground and sometimes called a solid bulb.
- Corolla*, the circle of petals in a flower, found outside the stamens and within the calyx.
- Corymb*, pedicels of unequal length, the lower longer so as to form a flat-topped cluster; *corymbose*, in corymbs.
- Costate*, ribbed.
- Crenate*, with rounded or blunt teeth; *crenulate*, the diminutive.
- Crustaceous*, shell-like.
- Cucullate*, hood-shaped, cowlled.
- Cuneate*, widening gradually and regularly upwards from a pointed base; wedge-shaped.
- Cuspidate*, tipped with a cusp or short hard point.
- Cyme*, a flower cluster in which the terminal or central flower blooms first; *cymose*, after the manner of a cyme.
- Deciduous*, falling when ripe or after the function has been performed; a corolla is deciduous when it falls after anthesis; deciduous trees shed their leaves in autumn.
- Declined*, curved downward or forward.
- Decomound*, several times compounded.
- Decumbent*, lying on the ground but tending to rise at the end.
- Decurrent*, where the edge of the leaf runs down on the stem forming lines or wings.
- Decussate*, opposite but each pair placed at right angles or over the intervals of the pair above or below.
- Deflexed*, bent abruptly downward.
- Deltoid*, triangular with equal sides.
- Dentate*, toothed with the teeth standing directly outward.
- Denticulate*, dentate with fine teeth.
- Di-*, a prefix to Greek words, two or twice.
- Diadelphous*, stamens united into two sets.
- Dichotomous*, branching or forking with the two divisions nearly equal.
- Didymous*, twin, found in pairs.
- Didynamous*, said of stamens in 2 pairs with one pair shorter than the other.
- Digitate*, parted or divided like the fingers of a hand.
- Dilated*, widened or broadened, applied to flattened or wing-like struc-

- tubes; *dilatation*, that which is dilated.
- Diocious*, with stamens and pistils in different flowers on different plants.
- Discoid*, disk-like; without ray-flowers.
- Disk*, a development of the receptacle at or around the base of the ovary; in Compositae, the tubular corollas of the receptacle as distinct from the ray.
- Dissected*, several times cleft into small segments.
- Distichous*, in 2 ranks or rows.
- Distinct*, parts in the same circle not united; as "stamens distinct," separate from each other.
- Divaricate*, widely divergent.
- Divided*, cleft about to the base, or to midrib.
- Dorsal*, relating to or borne along the back.
- Emarginate*, with a sharp notch at apex.
- Emersed*, growing up out of or raised above the water.
- Endosperm*, starch or other reserve food stored with the embryo in the seed.
- Entire*, margin not toothed or indented.
- Equilateral*, equal sided, or with the same number of parts on a side; a pinnate leaf is equilateral when it has the same number of leaflets on each side of the rachis.
- Equitant*, astride, as if riding, like the leaves of Iris.
- Erose*, gnawed on the edge; *erosulate*, the diminutive.
- Exserted*, protruding beyond the surrounding organ; exserted stamens protrude beyond the corolla; an exserted corolla protrudes beyond the calyx.
- Exstipulate*, without stipules.
- Extrorse*, turned outward.
- Falcate*, sickle-shaped.
- Fascicle*, a close cluster or bundle of roots, stems, leaves or flowers.
- Favose*, with honey-combed surface.
- Fenestrate*, with transparent areas or window-like openings.
- Fertile flower*, one containing a pistil capable of producing fruit with good seed; *fertile stamen*, the anther containing pollen.
- Fid* or *fidus*, terminations meaning cleft or lobed; 3-fid means 3-cleft.
- Filament*, a thread, in case of a stamen the stalk supporting the anther.
- Filiform*, thread-like.
- Fimbriate*, fringed; *fimbrillate*, the diminutive.
- Fistulous*, hollow.
- Flabellate*, fan-shaped.
- Flexuous*, more or less zigzag.
- Floccose*, bearing locks or tufts of hair or wool.
- Foliaceous*, leaf-like.
- Foliolate*, having leaflets; 3-foliolate, with 3 leaflets, etc.
- Follicle*, a dehiscent seed-vessel derived from a single carpel, as a pod of the Larkspur.
- Free*, not united to another organ, especially when one circle of the flower is not united to another circle.
- Fruit*, the matured or ripened ovary with all its appendages or accessory parts as well as contents.
- Fruticose*, relating to a shrub; shrubby.
- Fruticulose*, diminutive of fruticose; relating to a little shrub, as *Bryanthus breweri*.
- Fugacious*, very promptly falling off or lasting but a short time.
- Fulvous*, tawny.
- Funiculus*, the stalk on which the ovule is borne in the ovary.
- Fusiform*, thickest at or above or below the middle and tapering more or less to each end.
- Galea*, the long or helmet-like upper lip in the Mint and Figwort families; *galeate*, having a galea.
- Geminate*, twin, in pairs, two side by side.
- Geniculate*, bent abruptly, like a knee.
- Gibbous*, swollen or distended on one side.
- Glabrate*, somewhat glabrous or becoming glabrous.

Glabrous, bald, not hairy.

Glandular, bearing glands, or having a surface which exudes a sticky or viscid liquid.

Glaucous, somewhat glaucous or becoming so.

Glaucous, whitened with a bloom.

Globose, rounded, more or less spherical.

Glomerate, compacted into a close cluster.

Glomerule, a compacted or condensed head-like cyme.

Glumaceous, like the glume (bract) of grasses, thin but firm.

Glutinous, with a sticky exudation.

Granulate, bearing granules or grain-like bodies.

Gynobase, an elevation or process of the receptacle bearing the carpels or nutlets.

Gyno-dioecious, having flowers on one plant pistillate, on another perfect.

Gyno-monoecious, having perfect and pistillate flowers on the same plant.

Habit, mode of growth, general aspect or hue of a plant.

Halophyte, a plant growing in salty soils or alkaline soils, mostly succulent plants with thick or small leaves; the Pickleweed, *Atriplex* and Kern Greasewood are typical halophytes.

Head, said of flowers in a globose cluster, being sessile and collected at the same point on the peduncle.

Herb, a plant without woody stem or parts, at least above ground.

Herbaceous, like an herb in appearance or habit, or in texture or color, as *herbaceous sepals*, meaning green or leaf-like.

Herbage, the vegetative parts (stems and leaves) produced in the season, not including the flowers or fruit.

Hispid, with stiff or rigid hairs.

Hispidulous, minutely hispid.

Hooded, said of an organ which is curved or concave at the top like a hood.

Hyaline, transparent, translucent.

Hydrophyte, a plant adapted to live in water or very wet soil, chiefly

characterized by a thin epidermis, reduction or absence of roots and reduction of the vascular system as in the Pond Lilies, Pond Weeds and Duck Weeds, or by succulence as in Arrow Head, or by tall unbranched stems with narrowly linear leaves, or leafless as in the Bulrushes and Sedges.

Hypogynous, inserted on the receptacle, with the parts of the flower under or free from the pistil.

Imbricate, overlapping like the shingles on a roof so as to cover or break joints.

Immersed, growing wholly under water.

Incised, cleft or cut irregularly and sharply.

Included, not protruding beyond the surrounding organ; included stamens do not protrude beyond the corolla.

Incomplete, said of a flower which has not all of the four circles.

Incumbent, said of cotyledons when the back of one of them lies against the caulicle.

Indefinite, variable or uncertain in number, numerous.

Indehiscent, said of fruits or pods which do not split open.

Indigenous, native to the region.

Indument, with a close pubescence or coat of hairs.

Induplicate, with the tips turned in.

Indurated, hardened or becoming tough.

Inequilateral, not equilateral, which see.

Inferior, growing or placed below; inferior ovary, one more or less attached to or united with the calyx; inferior stamens or lip of corolla, i. e., with the stamens or lip on the lower side of the flower.

Inflated, distended or bladdery.

Inflexed, bent or turned abruptly inward.

Inflorescence, a flower-cluster, or in particular the mode of arrangement of the flowers in a cluster.

Innate, borne on the apex.

- Innovations*, in Gramineae, barren shoots.
- Inserted*, attached to or growing upon.
- Internode*, the portion of the stem between two nodes.
- Interrupted*, not continuous and regular.
- Introrse*, turned inward.
- Involucel*, a secondary involucre, as that of an umbellet; a circle of bractlets.
- Involucre*, a circle of bracts subtending a flower cluster; *involucrate*, provided with an involucre.
- Involute*, rolled inwards from both sides.
- Irregular*, the parts not of the same size and shape.
- Keel*, a longitudinal central ridge on the back of an organ, like the keel of a boat; the two lower petals of a pea-like flower which are joined into a keel-like body.
- Lacerate*, irregularly but not necessarily deeply cleft or torn.
- Laciniate*, cut or slashed into narrow divisions.
- Lamellate*, composed of thin plates.
- Lanate*, densely woolly.
- Lax*, loose.
- Leaflet*, one of the divisions of a compound leaf.
- Legume*, a 1-celled seed vessel, composed of a single carpel, which dehisces by both the ventral and the dorsal sutures into two valves.
- Lenticular*, shaped like a lens.
- Ligneous*, hard and woody.
- Ligule*, strap-shaped body such as the ray in the Sunflower Family; in Gramineae the exerted portion of the hyaline membrane lining the sheath.
- Limb*, a border, the blade of a petal or the spreading part of a sympetalous corolla.
- Line*, $\frac{1}{12}$ of an inch.
- Linear*, very narrow, with parallel sides; 4 or 5 or more times as long.
- Lip*, one of the two divisions of a bilabiate corolla or calyx. (See Bilabiate.)
- Littoral*, growing near or under the influence of the sea.
- Lobe*, a division of an organ, especially one which is rounded; leaf lobes are usually not deep; leaves may be lobed, parted or divided depending upon the depth of division. (See Parted and Divided.)
- Loculicidal*, a capsule splitting longitudinally into the backs of the cells.
- Lodicules*, in Gramineae, minute hyaline scale-like organs at the base of the stamens, whose function is the opening of the floral envelope at anthesis.
- Lunate*, crescent-shaped.
- Lyrate*, shaped like a lyre, the terminal lobe of the leaf large and rounded with the lower pairs smaller.
- Mammaeform*, breast-shaped or bearing breast-shaped prominences.
- Marcescent*, withering but persistent, not falling off.
- Maritime*, growing on the sea-coast.
- Membranous*, or *membranaceous*, thin, soft, and more or less pliable like an animal membrane.
- Merous*, parts or members; used in compounds, as 5-merous, having 5 parts.
- Mesophyte*, a common type of plant growing under the most favorable conditions of soil and moisture, characterized as a whole by a lack of special adaptations and by a great and diverse development of the leaf surface; Maples, Alders, and Mustards are typical mesophytes.
- Monadelphous*, stamens united into one set.
- Moniliform*, like a necklace or string of beads.
- Monoeious*, with stamens and pistils in separate flowers on the same plant.
- Montane*, of or growing in the mountains.
- Mucronate*, tipped with a mucro or sharp but rather soft point; *mucronulate*, the diminutive.

- Multicipital*, with many stems from one root-crown.
- Muricate*, bearing rough and rather sharp excrescences.
- Muriculate*, diminutive of *muricate*.
- Naked*, destitute of covering or appendages; naked head, without foliaceous or other bracts surrounding or concealing the involucre or head; naked stem, scape or inflorescence, leafless; naked flower, one without perianth.
- Nate*, termination meaning divided, as 2-nate, 3-nate.
- Nerve*, simple or unbranched vein, a slender or secondary rib.
- Neutral*, said of a flower having neither stamens nor pistils or at least without functional ones.
- Nigrescent*, becoming blackened.
- Node*, the place on a stem where a leaf is borne.
- Nut*, an indehiscent fruit with a hard firm wall, resulting from a compound ovary.
- Nutlet*, a diminutive nut, applied to a fruit derived from a simple ovary, or to a compound ovary which splits up at maturity.
- Obcompressed*, flattened on the anterior and posterior sides or fore and aft, instead of laterally or side-wise; obcompressed pod in Cruciferae, flattened contrary to the partition.
- Obcordate*, inverted heart-shaped, with the notch at the apex.
- Oblique*, unequal-sided, as in leaves which are larger on one side than the other.
- Oblong*, two or three times longer than broad and with nearly parallel sides, or somewhat tapering to each end from the middle.
- Obsolete*, imperfectly or scarcely at all developed, or abortive; *e.g.*, the lower lip of a calyx is obsolete when it is obscure or not very distinctly developed.
- Obtuse*, blunt or rounded.
- Opposite leaves or branches*, two from each node, proceeding from opposite sides of the stem; "stamens opposite petals," when the stamen is set before the petal; etc.
- Orbicular*, round or roundish.
- Orthotropous ovule*, a straight ovule, one not inverted on its stalk.
- Ovule*, the body in the ovary which becomes a seed; *ovulate*, bearing ovules.
- Palate*, the lower side of the throat in a bilabiate corolla.
- Palea*, chaff-like pappus borne on the achenes of the Sunflower Family; in the Grass Family the upper of the two modified leaves subtending an individual flower.
- Palmate*, with the divisions or sinuses of the leaf pointing to the petiole; palmately compound, with the leaflets all borne at the apex of the common petiole.
- Palmatifid*, cleft so as to resemble the outstretched fingers of the hand.
- Paludose, palustrine*, living in a marsh or swamp.
- Panicle*, a compound flower cluster, a raceme, spike or corymb which is compounded by branching.
- Papillate*, bearing minute nipple-shaped protuberances.
- Pappus*, the modified calyx-limb borne on the achenes of the Sunflower Family, usually occurring as bristles, naked or plumose hairs, scales or chaff.
- Parietal*, referring to or borne on the wall or sides of an organ.
- Parted*, cleft to below the middle.
- Pectinate*, cleft into closely set divisions like the teeth of a comb.
- Pedate*, palmately divided with the lateral divisions 2-cleft, thus resembling a bird's foot; *pedately*, in a pedate manner.
- Pedicel*, stalk or stem of a flower in a flower cluster; *pediceled*, having a pedicel.
- Pedicellate*, having or possessing a small or short pedicel.
- Peduncle*, stalk or stem of a flower or flower cluster; *pedunculate*, having a peduncle.
- Peltate*, round, with stalk or petiole

- attached on the under side at the middle.
- Penicillate*, with a tip or cluster of fine hairs or bristles.
- Perfect*, having both stamens and pistils in the same flower.
- Perfoliate*, where a stem seems to pass through or pierce a leaf.
- Perianth*, the floral envelopes, including both calyx and corolla when both are present; applied here chiefly to those flowers in which there is no marked differentiation into calyx and corolla.
- Perigynous*, inserted on the calyx.
- Persistent*, falling away very tardily or not at all.
- Personate*, when the bilabiate corolla has a very prominent palate or elevation in the throat.
- Petal*, one of the parts or divisions of a corolla, usually colored.
- Petiolate*, having a petiole.
- Petiole*, the stalk of a leaf.
- Petiolule*, the stalk of a leaflet.
- Pilose*, with long soft hairs.
- Pinnate*, with the leaflets arranged along each side of a common petiole.
- Pinnatifid*, cleft in a pinnate manner.
- Pistillate*, provided with or containing a pistil or pistils, but no stamens; fertile; said of a flower or a plant.
- Placenta*, that particular portion of the ovary wall which bears the ovules; it is sometimes strongly differentiated; axile placentae are borne on the axis of the ovary or fruit; parietal placentae on the walls of the ovary or fruit.
- Plaited*. See *Plicate*.
- Plane*, flat and even, without elevations or depressions; opposed to concave, convex, revolute, etc.
- Plicate*, folded into lengthwise plaits or folds.
- Plumose*, finely and abundantly branched, like a plume.
- Pod*, general term for any dry fruit which splits open; strictly a legume or follicle.
- Polygamous*, having perfect, pistillate and staminate flowers on the same individual (polygamo-monoecious) or on different individuals (polygamo-dioecious).
- Posterior*, the side behind, in an axillary flower the side next to the axis; superior.
- Prickly*, armed with prickles or short sharp hard outgrowths of the epiderms of leaves or stems.
- Prismatic*, shaped like a prism, with flat faces separated by angles.
- Proliferous*, bearing supplementary flowering branches or shoots from or near the summit or from the inflorescence, which surpass the stem or inflorescence.
- Prostrate*, lying close along the ground.
- Proterandrous*, the anthers of a perfect flower dehiscing before the stigma is receptive; *proterogynous*, the reverse condition.
- Puberulent*, minutely pubescent.
- Pubescent*, clothed with hairs, especially soft or downy hairs.
- Punctate*, dotted with point-like depressions.
- Pungent*, terminating in a rigid, sharp or prickly point.
- Pustulate*, dilated like a blister.
- Quinate*, borne in or divided into fives.
- Raceme*, a flower cluster in which the flowers are borne along the peduncle on pedicels of nearly equal length.
- Racemose*, like a raceme.
- Rachilla*, in Gramineae, the axis of a spikelet, on which the bractlets and paleae, with their enclosed flowers, are borne.
- Rachis*, the axis of a spike or raceme, the prolongation of the peduncle through the flower cluster; the axis or midrib of a compound leaf or prolongation of the petiole; in Gramineae the main axis and branches of an inflorescence, on which the spikelets are borne.
- Radiate*, arranged around or spreading from a common center; bearing rays.
- Radical*, leaves are called radical when inserted so closely to the base

- of the stem as to appear to come from the root; or when arising from a rootstock or other underground organ.
- Rameal*, borne on the branches.
- Ranks*, successive rows.
- Ray*, in the Parsley Family, one of the primary branches of an umbel; ray in the Sunflower Family, one of the marginal flowers bearing a ligulate corolla.
- Receptacle*, in a flower, that portion of the stem on which the sepals, petals, stamens and pistils are borne; in an inflorescence it is the axis or abbreviated stem on which the flowers are borne, as the axis of the head in the Sunflower Family.
- Reflexed*, turned downward or backward.
- Regular*, the parts in a circle having the same size and shape.
- Reniform*, kidney-shaped.
- Repand*, with slightly uneven margin.
- Reticulated*, with a network; netted.
- Retrocurved*, curving backward.
- Retroorse*, turned or pressed backward.
- Retuse*, with a broad shallow notch.
- Revolute*, rolled backward from each side.
- Rhombic*, quadrangular but the lateral angles obtuse.
- Rib*, a primary vein of a leaf.
- Rootstock*, prostrate or underground root-like stem, sending up from season to season herbaceous shoots and bearing roots on the under side.
- Rostrate*, with a beak or spur; narrowed into a slender process; *rostellate*, the diminutive.
- Rosulate*, said of radical leaves spreading in a circle or rosette on the ground.
- Rotate*, wheel-shaped; spreading flat or horizontally and circular in outline.
- Rudiment*, an imperfectly developed organ, a vestige.
- Rugose*, having wrinkles or rugae; *rugulose*, finely wrinkled; *rugulæ* fine wrinkles.
- Runcinate*, sharply incised with the teeth or incisions turned downward.
- Runner*, a slender prostrate stem rooting, more or less, at the nodes.
- Sagittate*, shaped like an arrowhead.
- Salient*, projecting prominently, in an isolated manner, beyond the main body or series.
- Samara*, an indehiscent winged fruit like the key of a maple.
- Saprophyte*, living upon dead organic matter and thus destitute of chlorophyll.
- Scabrid*, slightly scabrous.
- Scabrous*, rough to the touch; *scabroulose*, minutely scabrous.
- Scale*, a small thin body, not at all or little green, commonly glabrous; in Gramineae minute organs at the base of the stamens. (See Lodicule.)
- Scape*, a leafless flower-bearing stem arising from the ground.
- Scarious*, thin, dry and not green.
- Scorpid*, said of a 1-sided inflorescence which is circinately coiled in the bud.
- Scrobiculate*, marked with numerous small depressions.
- Scurf*, small, bran-like scales on the stem or leaves.
- Second*, inserted on (or turned to) one side of the stem.
- Sepal*, a leaf or division of the calyx.
- Septal*, relating to a septum.
- Septicidal*, a capsule splitting between the partitions of the cells.
- Septum*, a partition in an ovary or fruit.
- Sericeous*, silky with straight soft hairs.
- Series*, successive rows.
- Serrate*, toothed or saw-like, with the teeth turned forward or upward.
- Sessile leaf*, leaf without a petiole and the blade seated directly on the stem; sessile ovary, one without a stipe.
- Set*, a cluster or collection of organs of the same kind.
- Setaceous*, bristle-like.
- Setose*, beset with bristles; *setulose*, the diminutive.
- Sheath*, where the base of the blade or expanded petiole completely en-

- closes or sheathes the stem for some distance above the node.
- Silicle*, a short silique not much longer than wide; sometimes indehiscent.
- Silique*, a 2-celled capsule, several times longer than wide, the valves splitting from the bottom and leaving the placenta with the false partition stretched between.
- Simple*, unbranched or without branches; simple leaf, the blade composed of one piece; simple pistil, of one carpel.
- Sinuate*, with a recessed margin.
- Sinus*, with a recess or indentation, literally a bay.
- Smooth*, not rough; opposed to scabrous, echinate, etc. Cf. Glabrous.
- Sordid*, of a dull white or dirty hue.
- Spadix*, a spike with a fleshy axis.
- Spathe*, a bract enclosing a flower cluster.
- Spicate*, in the form of a spike; spike-like, especially when flower clusters are arranged spicately.
- Spike*, a flower cluster in which the flowers are sessile and more or less densely arranged along a common peduncle.
- Spikelet*, a secondary spike; the flower-cluster of Grasses.
- Spine*, a sharp-pointed hard woody organ; homologous with a leaf; *spinescent*, ending in a spine or sharp rigid point; *spinose*, furnished with spines or of a spiny character; *spinulose*, the diminutive.
- Spur*, a slender and hollow extension or prolongation of some part of a flower, as the petal of a Columbine or calyx of a Larkspur.
- Squama*, a scale; *squamate*, scale-like; *squamella*, a diminutive scale; *squamellate*, like a little scale.
- Stamen*, one of the male organs of the flower.
- Staminate*, bearing or containing stamens but no pistils; sterile; said of a flower, flower cluster or plant.
- Staminodium*, a sterile stamen, usually one in which the anther is wholly obsolete and the filament much developed or dilated.
- Stellate*, with rays like those of a star, star-shaped.
- Sterile*, barren; a stamen without anther or an anther without pollen; a flower without a pistil or with imperfect pistil; ovary without good ovules.
- Stigma*, the receptive part of the style which secretes a sticky or viscid substance.
- Stipe*, stalk by which the ovary or fruit is raised above the receptacle.
- Stipels*, stipules of the leaflet.
- Stipitate*, having a stipe.
- Stipules*, small supplementary organs or appendages of the leaf, borne in pairs at the base of the petiole.
- Stolon*, a stem or branch bending or curving down at tip and there rooting. Cf. Runner.
- Stoloniferous*, bearing stolons.
- Striate*, marked with longitudinal lines, grooves or ridges.
- Strict*, close or narrow, closely upright and straight, not spreading.
- Strigose*, with straight appressed hairs or bristles.
- Strophiole*, an appendage near the hilum of seeds.
- Style*, the contracted or slender portion of a pistil between the ovary and stigma.
- Stylopodium*, the enlargement or disk-like expansion at the base of the style, as in Umbelliferae.
- Sub-*, prefix, meaning somewhat, nearly, or below, depending upon the context.
- Submerged or submersed*, growing under water.
- Subulate*, awl-shaped.
- Succulent*, juicy or fleshy.
- Suffrutescent*, woody at base, with a persistent woody portion above ground, but no implication of diminutiveness. Cf. Fruticulose.
- Sulcus*, a groove or furrow; *sulcate*, grooved or furrowed.
- Superior*, growing or placed above; superior ovary, one free from the calyx; superior stamens or superior

- lip of corolla, the stamens or lip on the upper side.
- Symmetrical*, with the same number of parts in each circle throughout the flower.
- Sympetalous*, petals more or less united into one piece, so that one can not be taken away from the rest without tearing.
- Synsepalous*, sepals more or less united.
- Taproot*, a single and often strong root descending perpendicularly into the earth.
- Terete*, round in the sense of cylindrical.
- Ternate*, occurring or divided into threes.
- Thorn*, a sharp-pointed hard woody organ, homologous with a stem.
- Throat*, the upper expanded portion or orifice of the corolla-tube.
- Thyrse*, a close or contracted ovate panicle; *thyrsoid*, resembling a thyrse.
- Tomentose*, covered with soft or woolly hairs.
- Torulose*, cylindrical but bulging irregularly at intervals.
- Tri-*, a prefix to Latin words, three or thrice.
- Trichotomous*, forking, with the three divisions from the same point and nearly equal.
- Trifid*, 3-cleft to the middle or somewhat more or less.
- Tripinnate*, thrice pinnate.
- Triquetrous*, 3-sided.
- Truncate*, cut off squarely at the end.
- Tuber*, a thickened fleshy and more or less rounded underground stem or root.
- Tubular*, shaped like a tube or hollow cylinder.
- Tufted*, short, close, and several or many together from the same stock. (See *Caespitose*.)
- Turbinate*, top-shaped.
- Turgid*, distended or inflated.
- Umbel*, branches nearly equal and proceeding from the same point, so as to form a flat-topped flower cluster.
- Umbellet*, one of the secondary umbels of a compound umbel.
- Umbilicate*, depressed in the center.
- Undulate*, wavy or wavy-margined.
- Unisexual*, flowers containing pistils only, or stamens only.
- Urn-shaped*, *urceolate*, globular and contracted at the mouth like an urn or pitcher.
- Utricle*, a 1-seeded carpel with loose coat.
- Vein*, in a leaf, a branch of a secondary rib or nerve.
- Ventral*, relating to or borne on the face.
- Ventricose*, distended or swollen on one side and not on another.
- Venulose*, having veins.
- Versatile*, swinging, turning freely on its support.
- Virgate*, long, slender and straight, like a virga or rod.
- Vitifform*, grape-like.
- Xerophyte*, a plant adapted to live in dry soil, on the desert, in sand or on rocky ridges, chiefly characterized by great thickening of the epidermis, condensation of the plant body, or reduction of the leaf surface. Cactus, Buck-brush, Manzanita and Pickeringia are typical xerophytes.

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